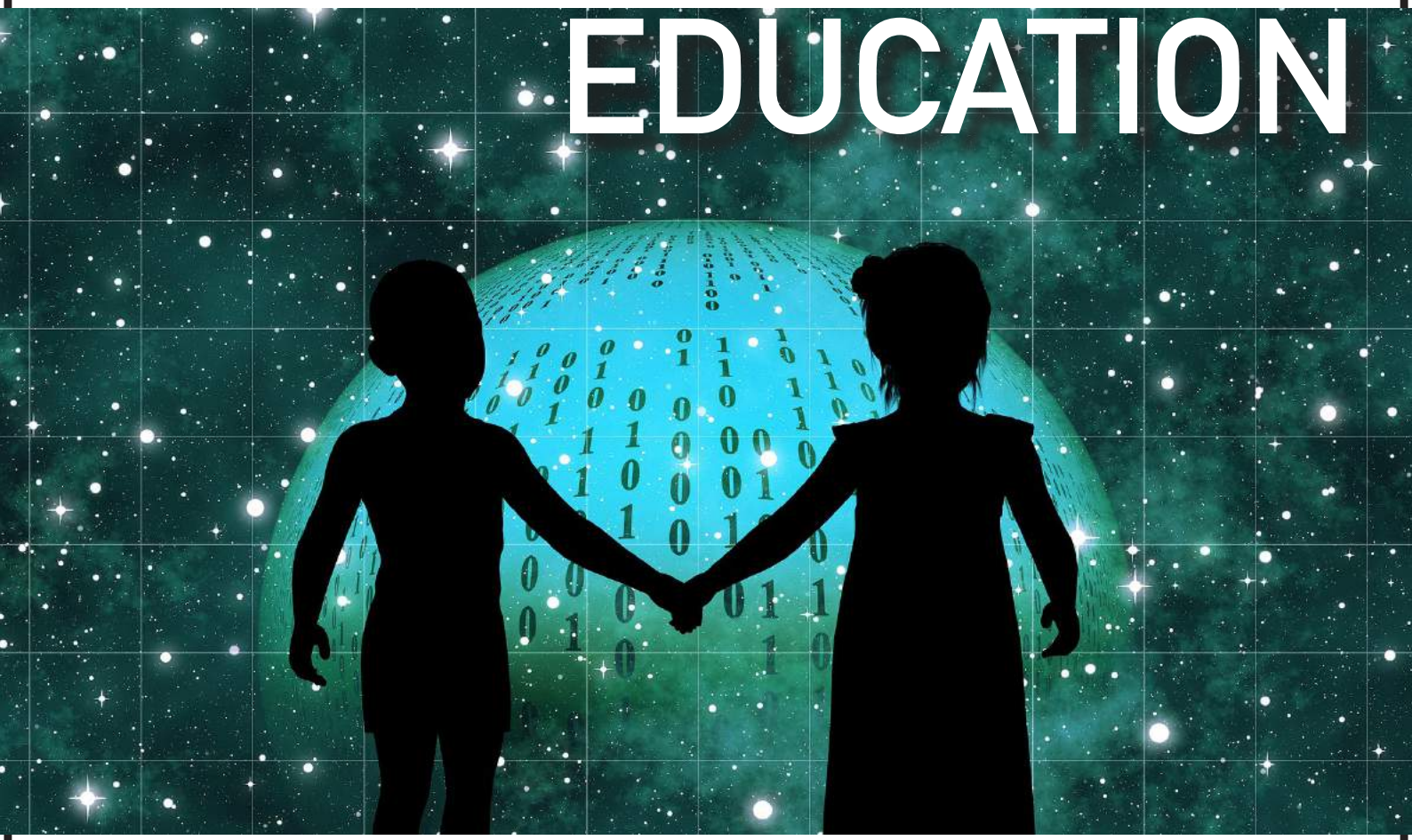
CREATING THE FUTURE OF EDUCATION



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IN ASSOCIATION WITH

EduTECH® ASIA 2018

FOREWORD

EduTECH Asia 2018 was a record breaker, with **over 3,400 attendees**, more educators in the audience than ever before and over 250 expert speakers, firmly establishing itself as Asia's most important annual education event.

Attendees enjoyed three days of dynamic and exciting content, including:

- Inspirational keynotes from renowned educators, such as *MIT Media Lab's Mitchel Resnick, Design Tech High School's Ken Montgomery, Natural Born Learners author Alex Beard* and more, and 200+ speakers sharing their insights across 8 premium conference tracks
- More opportunities to get interactive than ever before, with 43 roundtable discussions, 18 EduSLAM unconference sessions and 26 deep dive workshops
- **80+ exhibitors** showcasing their technologies and solutions, from hardware to software, and from global vendors to innovative start-ups
- The **IMDA Zone** offered insights into the innovative IMDA Lab on Wheels and Digital Makerspace programmes
- The **Robotics Zone** explored the potential of robotics and coding in education through a series of activities and hands-on mini workshops
- The **EduBUILD Masters Hackathon** gave us a glimpse of the future! 10 school teams presented the results of six weeks of mentoring and problem-solving in designing their own learning spaces
- Over 100 **#teachtechtalks** delivered by educators for educators, sharing their experience of using technology in the classroom

We wanted to create a memento of the 2018 edition and so are delighted to present you with this free-to-download e-book, featuring interviews with leading educators who joined us at the show. We'd love to hear what you think – please don't hesitate to reach out to us directly with your thoughts and comments.

We're already getting excited for 2019's edition, where we'll be bringing you more content, more networking opportunities, more sponsors and exhibitors and more educators! If you want to get involved, please get in touch and let's get started on your 2019 EduTECH Asia journey.

Best wishes,

Preeti Varadarajan
Project Director
EduTECH Asia 2019
preeti.varadarajan@terrapinn.com

Leonard Chen
Business Development Manager
EduTECH Asia 2019
leonard.chen@terrapinn.com

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ALIGNING POLICY WITH EDUCATION GOALS OF THE 21ST CENTURY

We are facing unprecedented challenges – social, economic and environmental – driven by accelerating globalisation and a rapid rate of technological developments.

At the same time, those forces are providing us with a plethora of new opportunities for human advancement. Underlying those opportunities, is the role of technology and how it will impact our lives, both presently and in the future.

In the **World Economic Forum**'s *Future of Jobs Report 2018,* it was found that by 2022, "***75 million current job roles may be displaced by the shift in the division of labour between humans, machines and algorithms, while 133 million new job roles may emerge at the same time.***"

As such, how ready the future workforce will be to take on these new roles will depend significantly on the kind of education they receive today. Gone are the days of mere rote learning and 'one-size fits all' approaches, as the future economy will require critical thinkers, original and creative ideas and the like in order to solve complex problems.

Schools can prepare students for jobs that have not yet been created, for technologies that have not yet been invented, or to solve problems that have not yet been anticipated. Beyond that, there's also a need for other education stakeholders such as policy makers, parents and the larger community to come together and cultivate an environment and culture that supports this shift in how today's students are being educated.

Ensuring that current workers do not fall behind as well, and are provided the opportunities to develop new skills and reskill, are also key to minimise the negative consequences of job disruption. Hence, the kind of policies formed today and over the next few years around education and the workforce will set the stage for how prepared we as a society will be for the future.

As part of **Edutech Asia 2018**, the first-ever **Education Policy Summit Asia** was held, where senior policy position holders from across 15 education ministries in Asia Pacific came together with various stakeholders of the education community to discuss the challenges, goals and possible steps forward in preparing students to become digital citizens of the future innovation economy.

Panellists included representatives from Singapore, Malaysia, Sri Lanka, Indonesia, Philippines, Myanmar, Vietnam, Cambodia, Bangladesh, Thailand and India, and while the challenges faced within their countries were diverse and unique, the underlying commonality was a shared desire to be ready for a 21st century characterised by digital transformation.

Developing Policy in a Fast-Changing World

In formulating policy to address the changes and challenges associated with a digital era, there needs to be a change on three fronts in order to create effective outcomes: Culture, Structure and Processes

Culture - Greater stakeholder engagement, such as public discourse is required in order to improve knowledge sharing processes within society.

Structure - Governments to move from a top-down hierarchical structure that's been well-established to a more holistic, Internet-based communication so that more participants can be engaged in policy formulation.

Processes - Beyond a one-off consultation with the various stakeholders, governments should ensure that the day-to-day is characterised by continuous engagement, involvement and innovation.

In the World Economic Forum's *Future of Jobs Report 2018,* it was found that by 2022, "*75 million current job roles may be displaced by the shift in the division of labour between humans, machines and algorithms, while 133 million new job roles may emerge at the same time.*"

At the same time, considering that digitalisation and digital transformation have far-reaching effects on all aspects of society, there then needs to be a whole-of-government approach in the policy formulation.

Governments are increasingly aware of this, as shared by **Dr Madura Wehella** *(Additional Secretary, Ministry of Education, Sri Lanka)*, where the Sri Lankan government established an Education Commission for education policy, with a mandate for recommending education policies to the President of Sri Lanka.

In doing so, the Commission sought a wide range of feedback from education stakeholders and youths in the country, which subsequently helped to influence the operational policies of the government.

A large consideration was given to the less-developed regions of the country to facilitate the infrastructure development of those areas to be on par with that of the urban cities, benefitting many of the students living in the rural areas of Sri Lanka.

Reflecting on her country's experience, Dr Wehella commented that *"In order to develop rational and practical policies, there needs to be more input from the beneficiaries. If the target groups of beneficiaries are reached and adequately consulted for data, then the formulation of policies would be more pragmatic as their voices are recognised."*

At the same time with the introduction of digital

technology and/or platforms which allow a wider and possibly easier outreach, Dr Wehella also thinks that is one way that technology can actually aid in the policy formulation process through such public consultations.

Another example offered by **Paulina Pannen, Senior Adviser on Academics at the Indonesian Ministry of Research, Technology and Higher Education** was the opening up of policy making to be at the provincial level, instead of having to adhere to the national level all the time. As the government recognised the need to become more open, Ms Pannen observed that with the introduction of this, it helped to speed up some of the decision making processes, which were encumbered by the top-down approach that was previously the norm.

On public consultation, Ms Pannen also noted that government leaders and agencies (not just limited to Indonesia) were mostly on board with using social media as a feedback and engagement channel, which certainly helps in policy formulation, or getting public support for new policies.

RAISING EDUCATIONAL STANDARDS IN DEVELOPING NATIONS

Many countries in Asia are now embarking or in the process of major educational reform, with countries such as Philippines, Vietnam and Cambodia making significant headway in improving the quality of education and its policies.

Whilst the outlook is overall a positive one, several challenges remain. *"Since we introduced an additional two years of basic education for our students (from the original ten) and undergone the curriculum overhaul, we need to ensure that the curriculum especially in science and technology remains up-to-date and well developed,"* **H.E Secretary Leonor Magtolis Briones, Secretary of Education, Department of Education, Philippines**, shared.

"Particularly for us and even other island nations in Asia, is the threat of natural disasters. Philippines remains vulnerable to these, and we've had everything from earthquakes to floods. This has not only caused destruction to school property, but computers and science labs too. So the demand for resources is always there."

In the case of Cambodia, the country has come far from its dark history, which resulted in a dearth of teachers and education resources in the early 90s. Concerted efforts have been made by the education ministry to overcome these challenges, and increasingly there has been a greater focus on STEM education, in recognition of the kind of skills and workforce required in the future.

Dr Rey Sopheak, Deputy Director General, Directorate General of Higher Education, Ministry of Education, Youth and Sport, Cambodia cited a few examples of what the government was doing in its educational reform efforts. Derived from the Cambodia Industrial Development Policy 2015 – 2025 plan, focus was placed on increasing STEM education and promoting STEM as an option for students, with ICT playing a supporting role. Initiatives such as the rapid expansion of universities and enhancing the quality of teacher education, which would result in the improvement of basic education.

ENCOURAGING LIFELONG LEARNING AND CONTINUED EDUCATION

As lifelong learning becomes increasingly critical for continued success and sustainability in the global workforce, countries are all trying to figure out how to remain competitive in a connected, globalised, and technology-driven world. Governments understand that the job market is changing quickly, and their workforce policies would need to evolve alongside this change in order to have a resilient workforce.

For most, the idea of lifelong employment in the same role with a single company is long gone. The global economy now demands workers to be nimbler than ever.

It will require ongoing acquisition of new knowledge and skills as well as the flexibility to adapt and thrive in different environments. This means having both the mindset and the resources to learn at every stage of life.

The efforts to promote lifelong learning by Singapore's government were highlighted during the summit as an example that countries may want to follow. With people as its primary resource, the Singapore government recognises the need to support those at risk of job displacement, as well as create new job opportunities through embracing new technologies.

It makes concerted efforts to help its citizens stay relevant by supporting programs for continuous learning, reskilling, and job placement. One such initiative is *SkillsFuture Singapore (SSG)*, a statutory board under the Ministry of Education that provides an array of lifelong learning and workforce development programs for people of all ages, including students, early-to-mid career professionals, and even seniors.

In January 2016, the Singapore government also convened the *Committee for the Future Economy (CFE)*, a policymaking committee whose objective was to develop strategies for supporting long-term economic growth in Singapore and in February 2017, published an extensive report that highlighted

workforce development as a critical priority area for the government.

The CFE report made specific policy recommendations for ensuring that Singaporeans have the resources to pursue lifelong learning opportunities, such as encouraging educational institutions and training providers to work closely with industry to ensure that their programs are matched to market needs. It also suggested that they build more modularised and flexible programs based on short courses or targeted certifications, so as to better accommodate the schedules of current workers who have existing career and family demands.

FROM COPING WITH CHANGE TO SHAPING THE FUTURE

At the conclusion of the summit, participants were asked to discussed how governments can transit towards becoming more proactive policy-making bodies in order to better handle the future that lay ahead. These were the key takeaways from the discussion:

- **Policy making needs to become more flexible**

Participants cited the use of the Happiness Index as a way to guide public policy making, and in doing so creates the need for a more flexible process

- **Move from a "fire-fighting" mentality to starting the fire**

Instead of remaining in a reactive position, policy makers should be allowed to initiate, set the infrastructure in place and subsequently move out of the way and allow other education stakeholders to come in

- **Invent the future, rather than predict it**

Policy makers should also capitalise on research evidence to create policy; at the moment there exists a big gap between the two as, for various reasons, they progress at vastly different rates. Therefore there's a need to close that gap in order for research to inform education policy in a timely and apt manner.

GAME CHANGERS

KEN MONTGOMERY

Executive Director, Co-founder
Design Tech High

As a teacher Ken held a variety of positions including: founding speech and debate coach of a team that grew from 15 students to 250 and was number one in Southern California, technology coordinator, conference champion football coach, a member of the USA Today All-teacher team, and National Board Certified teacher. While at Stanford Ken published several articles on school improvement and developed a school leadership course.

Q: Tell us a bit more about Design Tech High, and where technology plays a role in the school

K: We're located at the Oracle Campus in Silicon Valley. We serve grades 9-12 with an enrollment of 550 students. The foundation of what we do is design thinking, so we emphasize understanding your users and building solutions based on their needs. The students spend four years with us, and during the four years they have a design lab class.

First they learn the fundamentals of design thinking and progress from there. There are a couple of ways we use technology: give our teachers access to a lot of content because obviously being online, all our students have Chromebooks so tests, homework etc are carried out with that. Even more so we're using technology as a material - we don't want students just to consume technology we want them to create it as well.

Naturally Oracle helps a lot with that, they have taught basic computer coding and data visualisation classes for our students, and wearable technology, to name a few. One thing I appreciate is they focus a lot on giving access to underrepresented groups such as women or minority groups. There was one ninth grader who came in and after she took an oracle class she commented to me "*I realise a computer can do whatever you tell it to, you just need to know what to tell it.*"

That's why we envision technology as a material so some of the kids come up with a solution using design thinking and they use technology in carrying out the solution whether it's coding or using certain hardware, and they'll use basic tools like a laser cutter or 3D printer.

Image courtesy of Design Tech High School

Is there a philosophy of technology that you are teaching as well?

I think again it's seeing technology as a material and if we just really focus on technology as something that we use, then I think we're missing out because when I say it's a material what I mean

is students use it as a supply to build something so it's not just something to consume and they'll look at this laptop and it'll help me build something if I know what to tell it, if I know how to code or with this 3D printer if I build the right models out of it it'll help me build a prototype.

I believe that's our philosophy when it comes to technology. There's definitely also a social part of learning and even though all our kids have Chromebooks we're very mindful of the amount of time their eyes are on the screen so we make sure that the social aspect is embedded in their learning. I don't think that we're one great software programme away from revolutionising education so I think it's still done through people.

What were some of the challenges when you and your team when you first started the school?

Finding a space, a location.

We're very fortunate that Oracle built a building for us, I think that's a huge foundation for our success not just because it's a proper building but also the access we get to the employees who work with us on a voluntary basis and we're hoping that more private companies will want to embark on this - what I'd call a private public partnership so that there's more collaboration with public sectors.

The other thing is we set out to revolutionise high school,

"...in the industrial revolution muscles were the most important, and the one we're in now is brains, and the next one is the heart, but there's no proper way to assess that."

and when things get tough it's very easy to fall back on the traditional methods, so it was difficult for us to stay true to our innovation agenda, but we knew that was our goal.

In terms of the community acceptance of such a model, you guys are quite different from other schools, so was there a challenge in convincing parents or even students?

It certainly was, parents were basically signing their kids up for a school that didn't exist, we didn't have a proper building at first, no alumni, still hiring teachers, so it was a risk. But what the parents also knew was that their world was changing and what they were being asked to do at work was so different from what they were being asked to do 20 years ago so it didn't make sense that the school stayed the same.

So they'd go to schools and see something really similar and that wouldn't make sense to them. Also in Silicon Valley design thinking is a proven method for designing innovation solutions, so that helped with giving us credibility.

The approaches that the school is taking in design thinking and integrating it with your core curriculum, how do you think that's helping to make genuine personalised learning possible?

Our students don't necessarily use design thinking in their core classes, they still have traditional subjects like English, Physics etc we don't ask the teachers to incorporate that in their teaching but they do take a design thinking module for the four years they're with us and in their first year learn the fundamentals of design thinking.

For example it could be brainstorming for two weeks, interviewing for two weeks, protoyping for two weeks, and then the teachers incorporate some of the mindsets, for example the fear of failure and risk taking.

So a teacher can want to have their students in math be unafraid to fail but it doesn't necessarily mean having to use design thinking in math, because the risk is if you focus too much on design technology in a content class, you might miss the really important content.

I'm assuming technology is being used across the school, how is that changing the education of your students?

Firstly it gives teachers opportunity to curate content, with the kid having a device they have access to all kinds of content, and because they can curate and select they can set up assignments for the students and it makes collaboration a lot easier as well. It makes it a lot easier for teachers to give students feedback too.

However I think we haven't found the exact right tool yet, in terms of the infrastructure we haven't really reached the point where personalised education, the way we envision it, is quite there yet.

In that case in an ideal context, what would be the technology or scenarios that you see as supporting full and genuine personalised learning?

We're really pushing on being flexible with time, so we have one day a week where students build their own schedules, so they come in and meet with their advisors to plan their time.

They're doing that on paper but it would nice if there's a way to match time, people and content together. So for example a student would say I need to spend 1.5 hours on Math today, here's the time and the content, and here's the person that can help with that. So a teacher can come in and say ok I need to be with these 20 students today because they've all said they need 1.5 hours on Math, just to make things really flexible.

Is it a bit like an on-demand type of system?

Something like that, especially for example with the Oracle volunteers, where they can come in and see who needs their expertise or help, kind of like Grab but for education!

Then the kid can say I need help with this and someone will say ok I can help and it may not take an hour because right now time is allocated in a fixed manner but the kid might only need 20 minutes of teacher time, so it's about how we can make it really efficient with using time.

How do you think other educators or policy makers can apply what you're doing at Design Tech at a state-wide/nation-wide level?

I think for policy makers, they're mostly concerned with the outcome so we need to create very rigorous measures for things like risk-taking, curiosity, such it becomes more tangible for policy makers. Policy makers care about outcome and they want to see if a school is performing - are kids learning?

So we need to have a separate assessment system to asses these important characteristics because they'll become the

necessary skills for the future. Someone was saying that in the industrial revolution muscles were the most important, and the one we're in now is brains, and the next one is the heart, but there's no proper way to assess that.

As for schools they first need to be able to have the capacity to take on what we're doing in a way that can be translated into the traditional system, that's what we have to spend a lot of time on.

There's this notion that a lot of education systems worldwide are still clinging on to a traditional high-stakes testing in assessing student performance. Compared to your school's approach which considerably includes more qualitative aspects, how do you think we can ensure a balance?

I don't have a step-by-step answer for that, but we just have to implement what we know is the right thing to do. I haven't talked to anyone that says these high- stakes testing is really going to prepare our kids for an innovation economy, but it's just talking and no one's really doing anything about it.

But if we look at what happens outside the school is there a one and done test? I mean using Oracle as an example, there's no just one test where you pass and you're hired there are these other things as well, and that applies to every other job too.

I would love to see a shift in how we look at knowledge and we're not measured in a quantitative way, I mean we all know more than we have words for. One of my professors at Stanford used to say

"Describe what water tastes like", so we know what it tastes like but we don't have the words for it, so there's knowledge out there that we know but there are no words for it, and I think the challenge is how to get policy makers comfortable with that.

Going back to the use of technology, have there been any challenges when it comes to its actual use for either your staff or students?

I think biggest challenge for students, or rather the battle for this generation is battle for attention. The device is always in front of them so they have to be able to self-direct and manage their focus.

For the teachers, we don't have the right system to give immediate feedback on humanities, like we can do it for maths/science, teachers still have to grade essays manually and there hasn't been a way to give that kind of feedback yet.

In terms of learning spaces, I assume Design Tech is structured differently from traditional classrooms, so taking into account that learning will keep changing and new technologies will emerge, how do you think learning spaces should evolve?

When we designed the school we designed it with the thinking that we don't know how education will look like in 20 years, and I've said before that everything has an expiration date, so we designed it for maximum flexibility. So the walls are operable, there's a lot of customisable spaces, in a lot of ways the floor is like the canvas and we use furniture to customise the space using different furniture solutions.

A very practical example is the projector, should we mount it to the wall but maybe in 5 years time a projector will be miniaturised, or maybe we won't need it since the kids all have Chromebooks anyway. So we avoided making any huge expenses, because you never know when and how it'll change.

The advice we got was do everything on pencil and paper first until you're sure what you need. So I think the key thing is making sure the space is as flexible as possible. Make every decision based on flexibility, and with the thinking of how's the future going to look like in about 10 years' time.

PRAMOD TRIPATHI

Associate Director of Schools

Global Indian International School

Pramod has over twenty years of experience in school education, dealing with educational administration, policy formulation, manpower training, and HR management issues.

Q: How are you teaching technology to both staff and students?

P: Technology is supposed to be part of the classroom environment, you can't keep it in isolate. Firstly teachers have to learn how to use it. There's a lot we've done, such as run a buddy programme where we train a small group of teachers and then that small group trains the rest of the staff and it spreads to the classroom.

How do you see technoogy affecting change in pedagogy?

Technology is definitely driving change in pedagogy, you cannot remain a leader in education if you're not using technology. Teachers are still needed but the traditional way of teaching no longer applies, and we need to use the best technology available and maximise its benefits.

It's not about being dependent on it but utilising it. We want a blend of modern tools with some elements of traditional systems.

How do you think technology has helped to create genuine personalised learning for students?

The way topics are taught in the classroom is not the same as before. If I go into detail about learning style and patterns of students, you have auditory learners, visual learners and so on. In the classroom when a teacher designs a lesson you have to keep these learning patterns in mind so that it complements their style. Technology helps with that to ensure no child is left behind.

Everyone is learning but not everyone is learning at the same pace, so technology helps with that or otherwise the teacher cannot manage. To have that learning analytics data so that teachers are able to know their students' weaknesses and strengths, and generate customised lesson plans where students can also give their feedback, allows learning to happen beyond just the classroom.

Do you foresee any potential challenges or problems that could occur as technology use becomes more prevalent in the classroom?

One has to balance. Problems come when anything is in excess. We're trying to balance technology in terms of that which is why I say it's a blend. If a teacher wants to teach, the teacher has to divide that 40-minute period into sets of time where there's technology use and there are traditional methods.

Image courtesy of GIIS

So we're very conscious of this in lesson planning and ensuring the balance. In that regard teachers remain very essential; it's very easy to let technology take the lead since it can analyse student performance and even set assignments, but that human factor is lost, and the moment we take away our focus from that we'll start to have problems.

Too much technology use can result in our children having problems with forming social connections or emotional attachments to other as their main interaction in school is with a device or screen.

How is technology helping to make the running of the school more efficient?

Besides teaching, technology is rigorously used in administration. If teachers are absent in any one the campuses - for example a Math teacher in Dubai is absent today, and we are informed in advanced because of the time difference. I can get a teacher in Singapore to teach the class in Dubai through technology.

I can also view any campus through my laptop if I want to see what's happening in a class in another city. We have monitoring through RFID and cameras. in terms of administration and learning, technology is used extensively.

How about in parent-school-teacher communication channels?

Yes, and also students are our ambassadors when it comes to getting their parents on board in using the system we have to communicate with them, whether it's for accessing their children's grades or news bulletins and announcements from the school.

How do you think learning spaces need to evolve in order to adapt to this continuous change in learning?

When we talk about learning spaces, we're looking largely at the physical environment of the school. At GIIS, we have one area called the *Mist Classroom*, and the students can sit around on benches and it has a lot of greenery and fauna around, giving a natural forest feel and there's minimal technology there.

Then we have a technology zone where two classes can attend the same class and without physical movement, can have a class within campus or across campuses. In that regard we have what you can call a blend of environments, that can better adapt to the changes that will occur in learning.

Classrooms are also physically flexible where it can be combined into one if it's a joint teaching sessions.

In terms of the rest of the school, there're also aspects of administration, safety and security. It's perhaps less prevalent in Singapore, but things such as facial recognition software and the use of facial ID for entry to classrooms and school, even for visitors are part of the school's technology use.

Another example would be the booking of meeting rooms. After it's been booked in the system, access will only be given when the parents or visitors arrive on campus. That's very helpful on the administrative end instead of having to find an empty room at the time of the meeting.

"Everyone is learning but not everyone is learning at the same pace, so technology helps with that or otherwise the teacher cannot manage."

GAME CHANGERS

LUCY CREHAN

International Education Consultant and Researcher

*Lucy was a secondary school teacher before becoming interested in education research and policy. After completing her Masters, she set off on a six-month journey exploring world's top performing education systems in Canada, Singapore, Japan, New Zealand and Shanghai. Since returning from her trip she has published a trade book – **Cleverlands** – recounting her findings, and has worked in various advisory roles on education policy and reform.*

Q: How did you see technology being used at the top-performing education systems where you did your research?

L: In terms of technology, one of the big surprises in my journey was how little technology was used, or rather, not used in a particularly innovative or very different way from what I'm used to in England. Some schools were using interactive whiteboards, but apart from some game-based exercises, a lot of the time it was used as a projector for the teacher to share videos or powerpoint to help with the learning.

There was nothing in particular that I saw where ICT could be described as part of the explanation for why these systems are successful. Obviously, it doesn't mean that ICT can't be a factor in improving education, but it wasn't the case from my observations in the countries that I visited.

In fact, if you look at the data on ICT use in these countries, it's actually the opposite of what you might expect. Similar to my experience where these top-performing education systems weren't using that much ICT, if you look at performance in digital reading in PISA, the top 10 countries that do the best in digital reading are all using ICT in classrooms less than the OECD average.

The OECD also looks at reported ICT use and how that correlates with digital reading skills, it's quite surprising because the students who seem to do best in digital reading, are reporting using the Internet for school work about once or twice a month or once or twice a week. For those that are using it every day or almost every day, the performance drops off hugely. So it seems, though it's purely correlational, that for students that are using it every day, it's not benefiting their digital reading skills. The same applies for Mathematics, when they're using digital Mathematics or digital tools to help them learn mathematics more often, their performance drops off as well.

Why do you think this is the case?

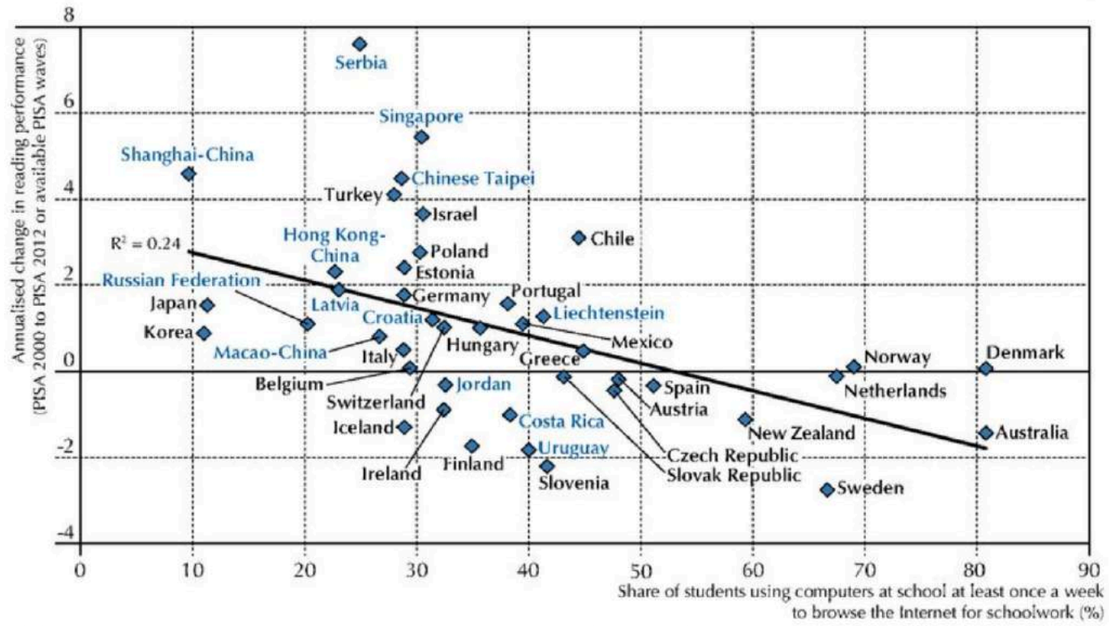
I have a hypothesis as to why there's this negative correlation, and it's based on the time I spent in Sweden. Sweden has one of the highest ICT uses in the classroom internationally and I was able to spend a week in Sweden observing lessons in five different schools, and the students all had their own learning devices.

What was happening in these classrooms - not all the time but often - would be that the teacher would give a task or project and ask the students to complete it using their computer. The students would get on with that for about 30-40 minutes, and what I saw was that some students would complete their task in the time allocated, but quite a few of them would be on Youtube, looking at football or manga.

So rather than becoming an instructional tool, it became a distraction for them from what they were supposed to be learning. I think that's a possible reason for the negative correlation, that's one idea.

In contrast, what teachers in these high-performing systems were doing was

Trends in reading performance and proportion of students who frequently browse the Internet for schoolwork at school



Notes: The annualised change is the average annual change in PISA score points. It is calculated taking into account all of a country's and economy's participation in PISA.
Source: OECD, PISA 2012 Database, Table I.4.3b (OECD, 2014) and Table 2.1.

actually more teacher involvement, which I know isn't the most fashionable thing to say, but by more teacher involvement I don't mean the teacher just standing in front of the class and talking through the whole lesson. What I mean is teachers in these different systems, they had a very clear idea of what they wanted the students to learn, and during a 40-50 minute period, those lesson were broken up into 10-15 minutes of activities that vary.

Some of that time would be the teacher talking but in an interactive way, framing the whole class discussion where students respond to each other. Sometimes it would be 10-15 minute group discussions, after which everyone would give their feedback. ICT could be used during this time, but the difference between that and the Swedish model was that it very defined.

For example you've got ten minutes and then we'll discuss what you found, so it's a bit more paced. Then there'll also be individual work, where the teacher goes around to help individuals.

What you saw less of in these top-performing systems was projects that extend beyond a week, where the students were directing their own learning using ICT. I'm certainly not saying that the latter is a bad thing, it's very valuable in helping developing children's independent skills on inquiry, but it's about the balance.

If you look at the OECD data that looks at different types of teaching, the balance that seems to get students to have a good understanding and application of mathematics and science (which is the data I was looking at) and do well in creative problem solving, the balance seems to be about three times as much with teacher-directed instruction, as opposed to a student-led approach.

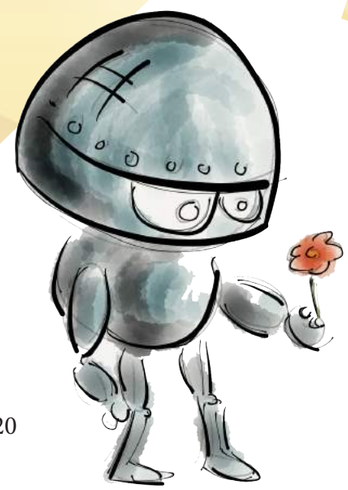
That was also similarly found in a report by McKinsey. They did an analysis of the PISA results in 2015 where the main focus was applied science (and not just repetition of what's in a textbook). McKinsey found that the sweet spot, with students scoring the highest, was for students to receive a balance in which most lessons were teacher-directed, with some lessons being enquiry-based.

It's surprising to hear you say that because I think a common belief nowadays would be that ICT can create a fundamental change in the way students are learning. How do

you think that educators can maximise their use of technology?

Well I certainly wouldn't want it to go away, it has so much potential, but there are not many places that have quite tapped that potential at a national level. Perhaps the implementation hasn't been thoroughly thought through and the assumption could have been if we give the students laptops and iPads and they have access that would help by itself, but if you look at the data you know that it hasn't. But again it's not a matter of that it can't create a positive change, but that it hasn't yet.

If I were to be philosophical about it, some people would see ICT as ultimately replacing the teacher, and if you can have really personalised software and programmes and students can go at their own pace, then that would be enough. I don't personally think that would ever be the case, from what I've seen and what I know of learning, that it would ever replace the teacher. Certainly I think the best use of ICT is when it's a tool, where it's managed by the teacher.



Fundamentally the teacher is the one who has the best understanding of the discipline they're teaching and of the student they're teaching. Where ICT can be really helpful is in adaptive assessment, where children can complete activities on their laptop and receive instant feedback on their work - I think that's really powerful, because a teacher can't do that.

Did you have the chance to find out if the schools you'd worked with had an ICT roadmap in place or plans to incorporate more technology use in their classrooms?

So I've been talking about general use of ICT in the classroom and how there wasn't a lot of that. What some of these countries did have was explicit teaching of technological skills. So for example, teaching robotics in a lab with Lego, or teaching coding to design computer games.

I see that as different from technology use in the classroom. Many people would say that technology is a good thing and the more technology that's used in the classroom the better, but the point I want to make is that it's not necessarily true and can actually have a detrimental effect, if it's not used intelligently, or if it's used when there's no problem for it to solve. If it's introduced for the sake of it then I can't see how that can be a good thing.

Of course students in the modern world will need to have a level of technological competency and have skills like coding and I fully recognize that, and in order to do that they need to be taught by an expert ICT teacher. But I don't then see the link entirely between that and why a Finnish teacher in an English classroom would need to do more than just showing a video in class which is helping her in the teaching of English.

Going back to the data from OECD, they also looked at task-focused digital reading - how focused the student is in finding the right information to complete the task. Bizarrely students who use ICT less regularly in school were more task-focused when it came to using ICT for a purpose. So I don't see the benefit of using ICT in all subjects for its own sake, I think it should only be brought in when it's meeting a particular need, but certainly students need to be taught ICT skills by expert teachers.

Is that a challenge for the various institutions that you've worked with? - how they can maximise the benefits of having technology in the classroom?

I'd draw distinctions between countries here, so those that I went to previously weren't using ICT a lot. But I've since been to countries to Sweden as I'd mentioned where they use ICT a lot. I do think a reason for that is a recognition that ICT is a fundamental part of the future and future working conditions and what our children's lives are going to be like.

But I think there are a few steps missing in terms of the thinking here, it's a big jump to go from ICT is the future to students should always have access to mobile phones and computers to use in whatever way they see fit to do their work. I think a lot of ICT software programmes, or things like social media are designed to be addictive, and to keep you on for as long as possible.

I myself am a working professional and I find it hard to stop myself going on Twitter when I'm supposed to be working. So it's almost unfair on students to give them that access in a non-controlled way. You need to have strong behavioural systems in place so students will not be tempted to get distracted. Otherwise let's face it - would you rather be researching about different types of fuel or would you rather be responding to an online message from someone that you fancy?

Moving on to these high-performing education systems and how they're different, what are three key characteristics that you found that they're doing for their teachers?

First of all their **initial teacher education** - these systems have very clear bodies of knowledge and skills that teachers are expected to master before they can graduate. It's quite clear for a trainee teacher or a teacher educator that in order to graduate as a qualified teacher, they'll need to know certain things which include not just the subject matter but also child psychology, and pedagogical content knowledge (which is the overlap between the subject knowledge and how children learn).

So teachers all get that as a basis, at least. But that's not the case in several other countries, where it can be much looser, and quality can vary very significantly between initial teacher training institutions. I think the key difference is the foundation that these teachers get, and also getting extensive time in schools, putting what they learn into practice and receiving feedback from a teacher mentor.

Secondly it's the **career path**. There are two different ways of approaching it, so for example in Finland they really front-load their teacher training and they have five years to get a degree, where if you're training to be a primary school teacher you'll go through every subject that you're supposed to teach as part of the curriculum and learn about it yourself and how children learn it.

Whereas in Singapore, you might have a one-year post-graduate course or a two-year diploma after high school which is for initial teacher education, but that's just the beginning, so the teacher's education is spread out across their career.

So you get your initial teacher training, and then if you want to progress through your career in terms of pay and responsibility, you have to demonstrate at different stages that you know more and are able to do more and have become a better teacher.

Rather than front-loading all of it at the beginning, it's still very much laid out in a clear sequence of knowledge and skills and attributes, but that's expected to be happening across your career.

Thirdly, something that's happening particularly in

East Asia, so Shanghai, Japan and also Singapore, **is lots of teacher collaboration,** especially in planning. There will be at least one period every week where teachers meet to plan next week's lesson. That may not sound very remarkable but for many countries including my own in England, America, and Sweden, you have teachers going home to plan their lessons on their own, so you've have lots of teachers planning the same thing at different places instead of coming together to plan and discuss; *ok we've got these resources, how can we improve, what work do we need to do*.

So there's informal learning going on between teachers in the schools. That happens not only at the school level but also at the network level as well. The more senior teachers will go out and meet with teachers of the same subjects from other schools and they'll share ideas and practices on how to best teach a subject, so there's a lot of learning from each other going on.

With more countries moving towards a digital economy, I believe there's a push by governments to want to increase the amount of technology being used in teacher education. How do you see that affecting the current structure of teacher development and training, and where increased technology use comes in?

Increasingly teachers need to have knowledge of ICT and different strategies of teaching and using ICT so that's becoming more a part of the teacher standards in many different countries. That works for the initial teacher education for new teachers, but then obviously you need to have more formal professional development for existing educators for ICT.

What I've mentioned so far isn't formal professional development in the sense of leaving school and going on a course, but sometimes that is necessary as well. But the introduction of knowledge and skills which covers not just ICT but also increased understanding of cognitive psychology, those are the kinds of things that teachers will need to have, courses or inputs in.

Where ICT can come in doubly, depending on the country, is where some teachers might not find it easy to travel to town to attend the training. The use of ICT for professional development in such instances is a growing area that I find very interesting. Instead of travelling, they can access content or training modules on their mobile phone for example, particularly if they're in a rural area.

Even then though that's not enough because teachers need to be able to use and apply it rather than just know it. They need to practice it in schools, so what would often help with that is teacher communities, where they meet regularly with a particular focus, help each other with their planning, execute it in the classroom and then come back next week to give feedback and see how they can improve.

That part is crucial for teacher development, because it's not enough to just go on a course or watch a video, teachers have to make that knowledge their own by putting it into practice.

"Many people would say that technology is a good thing and the more technology that's used in the classroom the better, but the point I want to make is that it's not necessarily true and can actually have a detrimental effect, if it's not used intelligently, or if it's used when there's no problem for it to solve."

K-12

DR ADAM COLE

Head of The Bradbury Club, Head of Science
Sacred Heart College

Dr Cole had a successful career in medical research for 17 years, publishing many papers in leading international journals, several awards and attracting significant grant funding. In 2015, he transferred into the education sector, where he used his industry experience to develop new and innovative ways to engage students in science. In particular, he created The Bradbury Club, which is a unique collaborative group of students, teachers and industry professionals that perform interesting, long-term and ambitious projects that benefit students and the community.

Q: How is technology being used in your school?

A: For us it's not the technology first, it's the project first, and that's in reference to the Bradbury Club. The Bradbury Club forms long-term ambitious projects that can go from months to years, and hopefully with good outcomes that students can be proud of and include in their CV.

In that club we have students working with staff and industry insiders on a project, and focusing on a successful project outcome is the number one priority. Of course we use technology to achieve that but it's the project that takes priority, and whatever that we need to get that done.

So the focus isn't the technology, but on learning and a successful outcome for the project.

Given the use of technology in schools nowadays, are you designing the project outcomes in a way that incorporates technology use? How does it influence the way you are designing the project outcomes?

Yes to some extent, we incorporate some technology but what we find is when we do the projects the technologies naturally become a part of the project and we don't necessarily know what the technology is before we start the project and then when there's a need we bring in the best and most appropriate technology in and also as I mentioned we bring in experts to help the students with using it.

So instead of us trying to adopt it and perhaps not doing it very well, we get industry experts or academic experts to consult to us and help implement and carryout out properly. We have a number of digital technologies that we're incorporating and I'm sure many other schools do that.

There's also a heavy focus in STEM schools across the world at the moment and that's really focused on the digital technologies such as apps, coding, drones, etc these are all fantastic things and we do some of that ourselves but we notice there's less of a focus on biology, in the use of these technologies in healthcare.

We've seen especially a boom in genetics in recent years and some massive breakthroughs in next-gen genome sequencing but these aren't really being filtered into schools. So we try to bring in and do our own PCRs and also a partnership with Deakin University where we have access to the genome sequences, and we're designing projects that incorporate these technologies, and once we do so we then pack them into kits which can then be disseminated to other schools. So we're trying to provide options in the genetics and biology field because right now they're not being fully explored enough in the schools.

When it comes to designing the projects what challenges have you faced?

We often come in with big ideas and how to get them done and we find that we lack the expertise, so that can be a bottleneck but that's where we consult with the experts, be it from universities or industry and usually it's a yes. They come in as consultants and we get their help in designing the project properly, and they check in from time to time.

"A real eye-opener for me was when I had to go out and interview industry experts on the kinds of skills they wanted from our students...many of them said we want skills and also attributes. We want passionate and resilient people, critical thinkers, problem solvers. So having excellent knowledge and related content yes, but these human aspects, those are key."

When it comes to using new and different technologies in the course of the project, do you train your staff to a certain level of competency before teaching the students or it's an ongoing learning process with the students, and have there been challenges?

At The Bradbury Club it's usually a hand-in-hand process and we have projects that are discovery-based so there's no end point per se, and we have to make sure the staff is up to speed with these technologies, but we do that in partnership with the students and the expert mentors. So it's a learning journey for both us and the students, and we see it as a benefit as it helps us keep up with the way technology is changing, because we can't not keep up with it.

A lot of times we talk about how technology is changing pedagogy, but at the same time there's also the belief that it's about integrating technology with pedagogy, what's your take on this?

I think it's both, the new technologies we've got in regular classrooms are really helpful. They benefit student learning there's not doubt about that. There's a wide variety of discussion on which is better than which but I think the general message is that it doesn't matter, you know if you're good at one just go with that. Some teachers might feel daunted at having to learn new ones but it's getting easier and easier to do so. Companies like Google and Apple make it easier for us so that's really appealing. A lot of these technologies are quite intuitive and for those that require expert help that help is also usually available.

How has technology been able to help make genuine personalised learning a reality for students?

Personalised learning in its simplest form is having an online course and having flexible pacing for different students with different learning speeds, but I like to think that personalised learning is much more than that. It's really about relationships between the adults, teachers, supervisors, guests experts and the students. And it can come in many different forms, flexible pacing is one of them, providing opportunities for students to explore their interests, I think that's critical.

What are some challenges you foresee when it comes to technology use?

I think the technologies that are coming in are generally beneficial, and it's becoming easier to use which really helps. The ones that are difficult to learn or take too much time to learn won't survive, so these easier-to-use technologies will gradually become more ubiquitous over time and I see them as beneficial, though it might be daunting to keep up.

There can be problems with social media in schools, I haven't noticed it as much in our school, in that sense we're lucky, I know social media can be a challenge but banning it wouldn't be the way to go because the benefits and potential for learning through that medium is so much more.

There's so much choice with technology and they're brilliant, but I think they need to be used authentically; the need has to come first. Going in to teach the theory behind the technology etc, I don't think that will create genuine engagement.

That's why at The Bradbury Club we place the emphasis on the project, because we believe when the students are engaged in achieving an outcome, that's where deeper learning will occur, and that applies as well to the use of a technology to achieve a project outcome.

On the projects you're are creating for the students, are they based on problems or challenges you see in society?

When we come up with a project or question it can be a problem in the community. For example we had congestion at the school and we developed a way to measure that using GoPro cameras.

On that note one thing I forgot to mention and is a tool I think everyone tends to overlook but should be using is the Excel spreadsheet, or any type of spreadsheet. Spreadsheet skills, that's so important in the workplace. This is a critical skill that most workplaces need, because it involves the analysis of data. So the traffic project was one that involved acquiring and analysing data using spreadsheets.

Another one was an analysis of property sales on streets with uncommon names so for example Butt Road, and we analysed about 47 years of sales data which amount to about 1.5 billion dollars. We found that sales of properties on those streets were about 20% lower than the norm, so it was great fun and we got some press out of it but the purpose behind that was to teach spreadsheet skills and also statistics. It's not just important for STEM careers, but also everyday life.

How do you think learning spaces of the future should look like, taking into account how learning is expected to evolve?

We are very lucky in our school we just had a building built that incorporates STEAM, we love teaching in it and more importantly our students love learning in it. It's very bright, and there are spaces for group collaboration and discussion. We have two large amphitheater spaces so students can gather in between lessons so it's these flexible spaces that are ad-hoc that encourage flexible and spontaneous discussions.

There are still classrooms but it's also designed to allow small-group discussions with screens at tables. I think that's the direction learning spaces are headed towards.

With regard to all the tools and what you're doing with The Bradbury Club, how do you think the use of technologies now in the school are helping your students prepare for the future?

I think one is making them aware and up to-date about these technologies because they will be part of their future. For example you look at drones they're a burgeoning industry but if you look at it only a small group of students will go on to work with drones even if it's a huge business.

But if the students learn coding that's used in programming drones, they can also apply these skills for another job in the workforce so I think all these technologies are useful in teaching them transferable skills for the future.

A real eye-opener for me was when I had to go out and interview industry experts on the kinds of skills they wanted from our students, and what was interesting was many of them said we want skills and also attributes. We want passionate and resilient people, critical thinkers, problem solvers. So having excellent knowledge and related content yes, but these human aspects, those are key.

It's early days still and there's a lot to learn, there's still a lot of the traditional elements of teaching in the classrooms with textbooks, but we're getting there slowly. There'll be trials and errors, and it might be slow and difficult, but it is the right direction for us.

K-12

BRETT SALAKAS

Educator MYP, Founder #aussieED and WorldSTEM

MLC School, Sydney

Brett is an international keynote speaker, an author, the founder of #aussieED and a moderator of multiple Twitter chats. He is a Primary School teacher and Google Certified Innovator who, over the past 20 years, has taught in South East Asia and Australia in both public and independent schools. He is passionately committed to turning educational theory into real classroom practice.

Q: Can you share a little with us on your journey with using technology in the classrooms?

B: Singapore's one of the places where I began my connection with technology, having worked here previously. I always had an affinity with technology and I worked as the computer officer and helped develop some resources that teachers could use with technology. It was pretty basic compared to what we can do now but it was used to help students develop their English language skills such as newsletter or newspaper publishing.

Following from that my careers has mainly been in curriculum development as a curriculum coordinator which I'm very passionate about. A few years ago my school in Sydney was one of the schools that worked with Apple to trial a BYOD programme using technology with the iPad.

So I was at the forefront of using mobile devices before most and what was really challenging about it was the normal ways in which people worked with each other, at conferences, networking, workshops and such, none of those worked because I was doing something that other teachers hadn't experienced - using a device that wasn't mainstream.

I had to reach out online to see what other teachers were doing where they were trying this out so in America and Europe, and now what that led to was creating a lot of online networks for myself and using hashtags and participating in a concept which is called an EdChat where teachers would meet online and discuss a certain topic. So I created one called #AussieEd and that grew to be the largest online network of teachers in Australia.

You mentioned working with different teachers across the years, how then have you seen technology affecting how teachers are teaching now versus 5-10 years ago?

I think the real, deep down truths or goals that teachers have, have not changed. We all want students to increase their proficiency, for them to score high and develop skills to make them successful for life. That's true for today, yesterday and in 20 years' time.

So the reasons that underpin education have not changed, what has changed is we've been able to use some form of technology to leverage and hone in and develop those skills even more.

Digital and tech skills involving collaboration are now more important than before, and allows them to work with colleagues from other parts of the world, developing those critical thinking situational skills, all those the buzzwords which form the 21st Century skills.

Where does technology come into play for this?

There exists the power of the pedigree of the technology that we use and there's a danger in that too. We have very powerful tools and these tools if used ineffectively, at best case scenario are pointless and time-wasting. At worst case, can really damage a child's well-being, you hear about cyberbullying and these other things so its very important that we look at technology and a teacher has to be confident, well-trained and really strategic about the way they plan to use technology in the classroom. If they do it well, the students will benefit, otherwise it's a waste of time.

So how do you think teachers can be encouraged or administrators can encourage teachers to gain confidence to be more tech-savvy and meet these challenges that you foresee confidently?

I think one of the things is that there's this false conception that you either have to be a traditional teacher with very traditional approaches, or you're a modern teacher with a 21st century approach. I think that's a fake argument; I don't think you need to be in just one of those camps.

I actually consider myself to be a pretty traditional teacher and perhaps it might be because of the time I spent in Singapore and I hold deep values in the quality of teaching and learning.

The message is it's not one or the another, you can hold those traditional values and I think it's important that we do but what you can do is use technology to tap into those values and teach even better. That's done through increasing connections, getting exposure and meeting teachers online, and the more exposure a teacher has, the more they're also willing and comfortable to use that medium to teach students.

What were some of the challenges that perhaps your colleagues have shared or you've encountered in increasing amount of technology use versus the support to do so?

Well it all comes from the top, if the people in leadership want to truly have a tech-savvy staff and students then they need to embrace that. You cannot send mixed messages, if you are going ton be an old-fashioned teacher but expect everyone to be modern or contemporary, you also need to embrace these tools like online collaboration that you want to see in your students in your administrative role.

If the other teachers see where it's coming from and see their leadership committing time and resources to do it they'll likely follow.

The trouble is a lot of people want to be able to say we're a great school and we're great with tech but they don't want to invest the effort. Just like there are some teachers who are reluctant to change, there are leaders as well who don't want to embrace that change.

For yourself how then are you using technology in the classroom?

One of the recent victories we've had this year is for our MYP science programme where we were looking at outer space. The curriculum for science for this age group was the solar system and its related topics. Together with the teachers I was working with, we created a customised virtual reality experience for our students to learn about outer space.

This isn't something you can buy off the shelf that's pre-programmed, and we made a customised activity that had several lessons that students could use be it with Google

Cardboard or their laptop and interact with the information we'd put there.

We started from the international space station and then they'll move from there to Mars, and around there there'll be some YouTube clips and links, and then some work from Google Drive and students took the information they learnt and documents into a traditional learning journal and from there because it was an enquiry-based learning, take any aspect of what they found interesting and creates artefacts of learning.

So because we used a unique approach to their learning, the students also created very interesting artefacts like holograms and AR/VR simulations of asteroid mining. There was a deeper learning involved as compared to a few years back with traditional methods, they got far more out of this than they every possibly could have.

In that regard do you think technology is enabling a systemic change in pedagogy?

Yes, technology is enabling a change in society, not just education. Society is changing because of technology. We meet, network differently now and because education is a reflection of society, how we're learning is also different now.

Earlier you mentioned deeper learning, so would you say that technology is making genuine personalised learning possible for your students?

That's exactly what it is, the tool itself is nothing, but it's the way the teachers use the technology that's powerful; the pedagogy behind it. You can have a great tool, use it poorly and it can have bad results. Or you can have basic technology, a great teacher who sets up a really rich learning task and has a great impact on student learning, it's all about the pedagogy.

You got to be very careful as there's a lot of buzz about products and it's very hard to look past the hype and see what's going to be pedagogically useful for your students.

What other challenges do you see?

One of the biggest challenges is the potential for technology's social purpose. We all want to live in a better world. In Australia we have issues with indigenous groups that cannot access quality learning and education so being able to get technology into these areas allows teachers to connect with these students.

It's similar in countries that are trying to pull away from poverty but you have children who are stuck in remote locations and cannot access the same quality education. Technology allows them to be able to connect and collaborate with peers and educators from another location and getting quality learning.

The challenge is getting the physical and digital resources out there for them to be able to use.

Talking about technology and its ability to enhance student learning, what about technology and parent-teacher communication?

For one the way we report about students' progress is changing. Once upon a time you'd do an exam and students will get a report card occasionally. You'd have to wait a period of time before you get feedback on your students' progress.

So what's coming out and becoming mainstream over the next few years is the online assessment and reporting, so you get instantaneous results and parents can learn where their children are the moment the tasks are completed. In that way schools and parents can work together better to help with the student learning

Do you see any issues with this level of transparency?

Certainly there'll be challenges. For example children may not perform how parents want them to perform so there'll be teething issues, but I think they'll be in the minority. We want to have true data about how our school and individual student is performing and the more open that data is the more accepting it'll be.

I think it'll be difficult for the first few years when parents realise maybe their child isn't as gifted or doing as well as they want but when the data becomes more regular and when we start to see trends in the data, we can infer causal relationships and trends in the students' performance and when we have this long-term data we'd be able to intervene to help with the student' well-being.

We don't want students to just get great marks but we want to holistically develop them to become the best they can be and a contributing member of society.

"...the tool itself is nothing, but it's the way the teachers use the technology that's powerful; the pedagogy behind it. You can have a great tool, use it poorly and it can have bad results. Or you can have basic technology, a great teacher who sets up a really rich learning task and has a great impact on student learning."

BEN SUMMERTON

Technology and Innovation Coordinator
Singapore American School

Ben Summerton is an experienced and passionate international education leader from Australia with K-12 experience in both public and private schools in South Australia and Victoria. He's currently the Upper Elementary Technology Coordinator at Singapore American School, and has served as Director of Educational Technology at Korea International School in South Korea. Ben is best known for developing professional learning programmes which include 'The Fish Bowl' and 'The LOFT', and can be found engaging with educators on Twitter at @bensummerton

Q: Can you share with us how technology has played a role in your journey as a teacher?

B: What I'm doing at the school right now is trying to modernise the current educational technology model as seen in many schools. The premise of edtech came from the introduction of 1-1 learning, and in that time technology coaches were seen as a supporting role to come in and teach the technology to both staff and students.

But I'm trying to shift this teaching of technology to where technology coaches are using their area of expertise and getting much more involved in the teaching and designing of the learning outcomes.

Teachers used to just book a technology coach at the point of delivery stage but right now I'm trying to change that and have technology coaches come in at the lesson planning stage, at the initiation of a new lesson.

We're constantly reviewing, rewriting and devising our units of study, and putting a lot of work in the design of a learning task. We can create strategies around where we're using technology, how we're using it and the highest level of technology integration we can achieve, which is essentially the goal of edtech.

But if it's going to be true integration, it needs to be at the curriculum level, and all that is part of the broader narrative of achieving personalised learning. So it's about **recognising that an ageing model of education needed to be updated**, and also with the end goal of personalised learning.

The seed of where that idea of modernising the edtech model came from is '*what do we mean when we use technology?*' People talk about technology in all sorts of ways, it ties in with STEM and different disciplines, but when we look at edtech teams or how we're using edtech, usually we're just talking about digital tech, and usually just screens.

So if we are taking STEM forward, it needs to be defined beyond just screens, and we want kids to be creating and making things. Digital technology is part of that, and that's where I'm trying to take edtech in that direction.

How are you spreading this to both staff and students?

I'm working with them, talking to teachers, requesting to be part of their work in learning design, and rolling my sleeves up and spending hours on it.

It's not about creating a big construct and not coming in on demand to teach an app, there's no structural set piece for that yet. It's more about building that partnership with teachers and allowing students to also have some agency in their learning direction. **It's about recasting our role, getting on their agenda, and working with them on things that need to happen.**

What are some of the challenges you've faced?

I think for us it's about scale, the scale of our school makes

it difficult. I'm lucky to be leading an educational team, but it's four people, and we service 1,800 kids.

So scale is one of the big challenges. The nature of our work and our priorities as a school is changing, so one of the challenges is identifying what matters, and what not as much.

It doesn't happen very often that we let go of something, Change is always about modernising something you're doing, often making it more efficient, but it adds to workload. It's hard because there's a need to re-prioritise, and give something up.

The big shift is about re-focusing on teaching kids transferable skills, and less emphasis on the actual content. Teachers are content experts, but when you peel back the content, and look at the skills that sit underneath that study, that's what we're focusing on. **In order to personalise learning, you actually need to equip kids with the skills, not the retention of the knowledge of a topic.**

Education is not the accumulation of the stored knowledge of topics that are often used in exams, it's about giving them the skills they need to apply flexibly in a whole range of contexts, that's the only real way you can personalise learning.

For example in a social studies class, kids might study the topic of revolution, and it may not be just one revolution. It can be different revolutions but what they're looking for is the common trends, the causality around revolutions. *What do they have in common or what was unique to the circumstances of one?*

Those are the skills we want them to learn so when we personalise learning, we can't just teach them content . We have to teach them skills and for a lot of teachers that's a hard adjustment to make because they're passionate about content and they've built their careers around doing it really well.

So back to my original statement - when you reprioritise , you have to give things up, and that's a difficult thing to do.

How is technology helping to make that change?

One of the key ways is the building of information systems that connect teachers and kids. Some of the significant work that's going on isn't exactly impacting the actual classroom learning events.

What it's doing is informing students and teachers about where students are at in their learning. At the moment we're designing a learning dashboard to help teachers get informed on where a student is at.

If you think about it, when a student walks into class at the start of a new year, the assumption we're challenging is *"Why do we always start the new school year with a blank grade book and with a clean slate?"* They've been with us for ten years so what can we do to help them advance in the first three weeks of a new course?

The teacher has to get to know that student with no information other than what their final grades were in the last exam. If there are certain competencies that are more applicable in some classes - for example constructing arguments in social studies - when school starts the teacher should be able to know where on that spectrum a student falls in and they can strategise to help bring the student forward from day one.

Right now we're considered as data rich but information poor, that's our premise. We have a lot of data but not a lot of it is useful and not used as resource to make informed decisions. Acknowledging that is helping with making an organisational shift towards making better use of the data we have.

The other thing we're trying to do is we're constantly complementing new technologies in the classroom. The interest in AR is definitely on the rise, and the development of its different uses that's moving from just being interesting to becoming actually useful. That's one thing I think is changing the classroom and impacting learning.

How do you see technology enabling a systemic change in pedagogy?

When you have a student profile and you begin a course with their profile that's an accurate read of their competency pathway and where they are, that changes the game pedagogically. It gives the teacher insight to the types of strategies that could work better with a student, and also how to challenge them.

"...when we personalise learning, we can't just teach them content. We have to teach them skills and for a lot of teachers that's a hard adjustment to make because they're passionate about content and they've built their careers around doing it really well. So back to my original statement – when you reprioritise , you have to give things up and that's a difficult thing to do."

That fundamentally changes the pedagogy; when we're data-rich and information poor we go into courses with a blank grade book and several weeks into the course where the teacher delivers a one-size fits all lesson. But when you have an information-rich learning environment, you don't go in with a one-size fits all pedagogical approach.

Does this require you to work with parents?

Every educator's responsible for working with parents so for example since moving to the tech field I've been doing tech information sessions for the parents, because one thing that's common is students are usually fairly far ahead compared to their parents on technology use and it makes parents worry.

It causes anxiety because at the end of the day we were all products of an education system that no longer exists, but because we were in it for so long and were successful in it, we intuitively think we're experts in what works. The adage of "*Well it worked for me, why do our kids need iPads?*" remains. So we need to challenge parents' thinking of "*I didn't need it and I'm successful, why does my kid need it and won't they just get distracted by it?*"

That creates a real challenge so around parent engagement, my response to that is to teach parents to be more confident with the tools their kids are using and see why they're important. My strategy is a lot on demystifying the technology and help them understand the why.

What I've noticed over the years is that parents and teachers are also becoming more comfortable with using the technology. These days they're more concerned (at least in our school) about social media and digital citizenship - how much screen time and what you're doing with it. How safe are you and what sort of relationships are you forming with other people?

So for last year instead delivering training or information sessions for parents, we did a series of sessions called *'Living and Learning in the Digital Age'*, and we paired up with school counsellors instead of tech colleagues and

conducted sessions about relationships and how technology plays a role in that.

If you think about it friends are the most important reason kids come to school, and they're now connected on Whatsapp or on Instagram. We can't take that away so what we need to do is know how to have these

conversations on their social presence online, and strategies around parenting for kids with technology.

It's a shift and a maturing of the idea of kids having technology in their hands. It's not gone away but it's less prevalent. It used to be parents telling me "*Aren't they a bit young?*" but now it's more "*Ok technology is more than screens, how can we manage that?*"

How do you think learning spaces, whether in school or at home need to evolve in order to adapt to the new ways of learning?

For starters **learning spaces need to reflect the idea that learning is no longer the segmented way that has been in schools for the last 150 years**. There really is no such things as Math, English and Social Studies where you study these things in silos.
In the real world these things are often all meshed together, and the skills you have are combined to make you the unique individual that you are. What schools have done in the past is silo out these skills and these disciplines but in truth learning is different to that. If kids are learning things that matter to them, then the learning will be much more successful for them.

But if we silo things by disciplines, they won't be able to make those connections which they'll need to do so in the real world when they leave school to become that successful citizen. Learning spaces can really play an important role in breaking down these silos that exist between subject areas and the teachers that teach them.

One thing we've doing over the years is we've been designing collaborative learning spaces

which we call it Pathfinders. It's four teachers, 92 students in a custom-built learning environment that's open, flexible and can be used in a whole variety of different ways and certainly connecting the different disciplines together.

That's where my expertise comes in, designing learning spaces that draw on the curriculum standards of a variety of different subject areas.

For example instead of doing a project on Socials Studies I'm doing one on sustainability, and it will include elements of Social Studies, along with Math and technology. It's a subtle shift but it's not only to allow our learning environments to connect these different disciplines, but because that's how the world works.

A lot of technology we put in the classroom is teacher-controlled for them to teach the kids, but in the Pathfinder this year we're introducing a decentralised system.

We bought micro-projectors to use in the classroom so students can connect wirelessly to the small projector and go off to a corner in groups and use the projector for their discussions. In that regard they're using the technology that their teachers have been using.

On audio learning, a lot of times the classroom is designed to be a one-size fits all so you have ceiling-mounted or wall-mounted speakers, that's designed for the whole class.

What if on top of that you have a couple of Bluetooth speakers on the shelf that students can access, and use in your small group discussions which doesn't impact the whole class?

So to me **the shift in learning environments is becoming open and flexible**, in order to connect your curriculum and make authentic learning possible. That happens when you're connecting disciplines and focusing on projects, not the subject area and putting technology within reach of kids.

K-12

ROLLY MAIQUEZ

Director of Educational Technology

American International School, Hong Kong

Rolly started the robotics program at AIS which now has six VEX IQ Robotics teams. His experience with VEX Robotics (VEX EDR and VEX IQ) goes back six years when he first established a team in a school in South Korea. From a small club of six students at that school, the robotics program grew to close to 100 participating students from elementary to high school. Rolly's passion and interests are in the area of educational technology, robotics coaching and training, creating, design, and innovation.

Q: How are you teaching technology, both to staff and students?

R: My approach generally begins with thinking about *"Why does it matter to me?"*. Why is the topic of my "lesson" or training important? Why am I teaching it and why do my students/colleagues need to learn it? What is the value for them? Once this is established, then we have a framework to work with.

I also like making sure that my students and colleagues have their own understanding of what their take-aways are from the lesson or training session.

Finally, I also want to make sure that the process is active, fun, and meaningful for all learners. I like having learners go through and seek solutions. In that regard I'm more of a "*guide by the side*" than a "*sage on the stage*".

How can you put technology in context?

"Technology" covers a very broad area of devices and uses. I'd say that putting technology in context is making technology relevant and meaningful in the world of the learner. In this area of "*educational technology*" – we deal with technology-based processes and tools that facilitate one's learning.

"*Putting into context*" also means understanding the world of the learner. Where will the technology be used? Why are we learning this or that? Most importantly, how will the learning be applied? I would work through these questions and do frequent check-ins with the person I'm working with to figure out the best learning and teaching path.

What challenges do you face in teaching technology?

There is a tendency for "*teaching the technology*" rather than focusing on the application of the learning. For instance, in teaching a video class, rather than focusing on teaching of how to use the tools for shooting video and editing the footage, I would focus on why developing a storyboard matters, why shooting good video matters, why creative editing matters, and so on and so forth.

In teaching robotics, I would focus on designing and prototyping and then working with the software for coding at a later stage.

It's not that I don't want to focus on the technology itself. I would rather like to **focus on making technology a part of the learning of the subject matter itself and not making technology a separate item to learn.**

How are you using technology in your classroom to enhance learning?

I think we all agree that teaching and learning happens with or without the use or help of technology.

However, as would the use of additional tools in basically any endeavour, bringing technology into teaching and learning opens

possibilities and innovations that would otherwise be difficult or not possible without the use of such technology tools.

For instance, in a school that focuses on integrating STEM into the curriculum, I might work with a Science Teacher on applying their lesson on simple machines using robotics parts. Students can build simple machines and then program their creations using the coding environment of the robotics system we use.

Is technology enabling a systemic change in pedagogy?

I believe that this is one of the affordances that technology brings about – the natural fit in teaching and learning. I believe that what we have is a natural evolution in the development of pedagogy. Just go back ten years, then 20 years, 30 years, and so on – you will notice movements or shifts in thinking and theorizing involving pedagogy.

The "traditional way" of teaching is now generally viewed as antiquated or dated and there are other models and methods of teaching and learning to call upon. In addition, there are also technology tools and technology-based processes and systems that have been blended with pedagogy in different levels.

However, is the change that technology brings about in pedagogy reaching the level of the system? I think the answer is yes – and it also depends on what system you are referring to.

For instance, within one school campus location, there may be fantastic technology infusion going on inside and outside learning spaces. Learners may very naturally pick up technology-based tools to complete their tasks alongside non-technology tools.

Learners are no longer required or guided to choose particular technology tools – they choose on their own based on confidence and

comfort level, needs of the task or project, and perhaps desired outcome and type of output.

Within such a school, it would seem that technology has integrated with the pedagogical practices of teachers and learners.

This may be considered the changing of the school's pedagogical system as highly influenced and led by appropriate technology use. Perhaps there may even be a transformation in the teaching and learning going on that may not have been possible or would have been difficult had technology not been as intertwined within systemic practices and tasks.

Then you could zoom out and look at a larger location – perhaps a school district or even larger, a collection of districts. Unless several or all schools within the location are operating at high levels of technology infusion in teaching and learning, I do not think that pedagogical change as a system influenced by technology would be highly significant. There may be pockets of change in the pedagogy – but the change might not be flowing throughout the whole system.

Nevertheless, change is still change, and micro improvements in pedagogy here and there eventually may add up to a change that would be seen as significant and may eventually even become systemic.

How is technology making genuine personalized learning possible?

Technology helps make personalized learning possible in the classroom – but it's the teacher that makes this happen. Nothing beats properly prepared lessons and good pedagogy. Technology steps in as the set of tools that allows learners to focus on their own learning goals and pace.

For instance, in a class setting with one-to-one iPads working on a unit in Language and Writing – some students might be using drawing tools to illustrate a poem they just wrote while others might be using video creation tools or music composition tools to creatively interpret their writing.

"A seasoned learning design should be able to work with these variables and come up with a learning space that is best suited for the learner. The technology piece should not be a separate conversation but something that's already included in the discussions on learning spaces."

In using a Learning Management System, learners may be progressing or creating at their own pace through a carefully and properly created learning module where challenges are presented to learners and they must complete these before moving on to next levels. A "badge system" may work best in this environment as learners earn these markers along the way – demonstrating their progress.

How is technology changing students' learning experience?

Technology extends the scope and range of a typical learning setting or module by providing the user with several affordances. Learners are no longer shackled to a specific time and place – the here and now of learning.

Within an appropriately prepared learning environment and with the aid of educational technology hardware and software, learners are able to chart their own learning paths and goals, design their own learning and use design thinking to work through challenges. They can also challenge other learners with their own ideas and questions and contribute to forming solutions for persistent global issues, and

What challenges do you face in using technology in your classroom?

I see two types of challenges - positive ones such as having insufficient time to continue learning as students are enjoying the session using technology, and also them realising that technology is not the appropriate learning vehicle for everything, and having to use other non-tech tools to achieve their goal.

The other type of challenges is to do with distraction and disengagement, over-reliance, and even straightforward issues with software and hardware. Even for that, the challenge can be having too much choice in terms of applications, and also too many devices.

How do learning spaces need to adapt to new ways of learning and new technologies?

The focus should, as always, be on the learners. Once this is established and operationalized, then I think the adaptation goes both ways. Learning spaces adjust to what's available in new learning and new technologies; new pedagogical models, new technology also need to work with what's available with learning spaces.

The bottom line is – all these now work hand-in hand in the planning stages. Ideally, one should no longer follow the other. Learning designers should look at what's available in the areas of technology, pedagogical models/philosophies, and learning space technology.

A seasoned learning design should be able to work with these variables and come up with a learning space that is best suited for the learner. The technology piece should not be a separate conversation but something that's already included in the discussions on learning spaces.

KERRY GITTINS

Primary Technology Integrationist

Renaissance International School, Vietnam

Kerry has worked in international schools for over 35 years, teaching in Australia, Papua New Guinea, Nepal, Vietnam, Sri Lanka, Germany and Switzerland, and is now back in Vietnam after a 25 year absence. Kerry is a passionate library, literacy and technology advocate, and sees all three as integral in helping to equip students with the skills and knowledge they need for the future. She doesn't view the library in the traditional sense, preferring instead to see it as a space that that encourages innovation, creativity, collaboration and community connections. Kerry always has at least two books on the go and is fascinated by all things tech.

Q: How are you teaching technology to the students and possibly even the staff?

K: In the last year I sat down with the teachers to see where they were at in terms of their skills and how they saw the use of technology within the classroom; what they were currently using versus what and how they'd like to be using.

It has to be seen as a support for teaching and learning, and not the only thing, because if the technology has no impact on student learning, then it's not a very meaningful use of the technology. If it's not meaningful then the children won't engage with it and remember how to use it properly.

That's what I discussed with the staff and coming in I've been able to integrate a lot of Office 365 programmes because we're a Office 365 school.

I've been able to implement class notebooks with the older kids and we've been looking at collaboration skills through Powerpoint and sharing the applications with each other .

Not only does that teach the kids new skills on how to use the technology, but it also means they need to learn to work together, because that's one of the key things technology can allow, which is collaboration and creativity.

It's not that it doesn't happen without technology but it adds another dimension to it because in terms of collaboration it's not just within the classroom but it extends to outside the classroom walls as well which is very important.

When you teach skills such as Powerpoint and collaborative skills, how are you putting it in context so that students see how it's helping him/her in their work?

It's done either during class time or library time. For example with the Year 4 students, we're doing a collaborative Powerpoint project and I meet them during library time where they learn the different skills that they'll need in terms of research and collaboration.

Although Powerpoint seems like an easy programme to use, it's different when you have the children collaborate on one particular slide and they're trying to do research and import information, and trying to decide whether it's relatable and relevant.

That's a huge step forward as they then have to learn to talk to each other about the information they're looking at, and pick out the information they really need. So when we teach them these research skills I'll give them guiding questions and we talk about what the key points are, and they'll search for images and information.

We'll discuss all this beforehand so I sort of scaffold it and model the discussion for them and then they put that into practice.

Have there been challenges in teaching the students these technology skills and getting them to use it?

Reliable connectivity is a big one, that's one of the main barriers to effective use of technology in the classroom. If you're in a first world country or developing one with really good Internet connectivity that's not a problem.

But for most people you can have the best lesson plan and the kids can be raring to go and then all of a sudden the Internet will go out. So reliable connectivity is a huge thing for us.

When it is there, some of the other challenges occur with students not all being at the same skill level. It takes some time to bring everyone to the same level and that's where if you have children in your class who are quicker and know a little more than others then you can group them with those who aren't. That helps with encouraging collaborative skills as they're helping their own classmate.

I think one of the things people worry about when it comes to technology use is that it takes away the face-to-face element of interaction. It can be especially so with some of the older kids when they're always on their phone.

But if you can have kids working collaboratively in this manner where they're sitting down together with the technology in front of them then that alleviates a little of that silo mentality where they're doing it all on their own and only communicating via their screens.

How do you see educational tools or technology as a whole changing how children are learning?

It's basically flipping the learning, where it's gone from chalk and talk to interactive whiteboards and being able to give the student more ownership of their learning and the teacher becomes a facilitator.

Teachers and teacher librarians are still needed because you still need someone to vet the tools and make sure the student are using them properly but it's a huge pedagogical shift where instead of the teacher being the one with all the knowledge, we're learning

"...you still need someone to vet the tools and make sure the student are using them properly but it's a huge pedagogical shift where instead of the teacher being the one with all the knowledge, we're learning together and students are also learning from each other."

together and students are also learning from each other.

How do you see these tools enabling genuine personalised learning?

I think it depends on the age group as well so for the younger students, I think it enables them to look at something they're interested in and learn from there.

For example if we were studying endangered animals then they'll each have to pick one animal to study, do their research and use a particular to represent their results. In that sense learning becomes personalised for them as it's done on an individual basis.

For the older kids I think it can become a network for them, where they're creating their own personalised learning network and can tap into different tools and connect with other students around the world to help with their own research and work, and technology enables all this.

In your role how are you collaborating with the teachers in ensuring a holistic approach to the use of technology in the classroom?

Right now we're trying to restructure the way we're communicating with each other and students, trying to streamline it and make it more user-friendly.

With Office 365 if you've got teams and if you've got a staff notebook you can have Skype conversations really quickly to ask for help or feedback and it makes for good collaboration too.

We've started doing that recently so instead of sending emails you can just send a quick comment and it'll pop up on your screen, and you can answer immediately and your colleagues aren't waiting for three days for a reply.

I understand you recently underwent a library transformation project, can you share with us on that?

What we wanted to do was to open the library up a bit more and I wanted to make it into a hub of the school where everyone felt comfortable coming into it, not just teachers and students but parents as well.

So we did a redesign on some of the shelving, we instituted a Genius bar type of fixture for the secondary section so it's a long desk with power points for the students to charge their laptops and sit there and work amongst the resources if they need to.

We've separated the primary and secondary area a bit more so there's a designated space for each of them but remains quite open. We also repainted the furniture and walls, and placed the comfy furniture in the middle of the two areas so that it could be used by both primary and secondary students.

We also got a few picture bookshelves for the younger ones, like flipped bookshelves because before that it was the traditional ones with the spine facing out, and if you've got four-year olds in to borrow a book they're not going to look at the spine they're going to look at the cover instead. Essentially we tried to make it more user-friendly and more welcoming for the students.

How do you think learning spaces need to evolve in order to adapt to the new ways that students are learning and technologies are in development?

The furniture has to be flexible, and ones that are height adjustable. For me I think we should have furniture that allows students to stand and sit when they need to, or write on a desk. We're not quite there yet but I think that for me having flexible furniture is important.

At the same time you still need to have the quiet areas for both younger and older students to do work or read and be in a quiet space.

Has technology also changed the way you are managing the library?

At the moment we're using *Follett Destiny* and what I've found out so far seems to be pretty good. They have an option for students to create their own book list and collections, so if you're researching on something you can search the library collection for the related topic and add it to your own collection.

We're still in early stages of using this but it looks to be a rather powerful tool for enhancing the way students are using the library and the collections, and i think that's the most important thing when it comes to technology.

Do you have to work with parents often?

We've held one parent morning so far to take a look at the library and the collections and to create a borrowing account for them because a lot of them didn't know they can borrow books from us too.

As an international school I think one of the things we should make it clear is that they can have a borrowing account so not only can they borrow for their children extra books, but they can also borrow for themselves.

When you create a collection you're looking at a whole range of genres, ages so you can then make your international library truly international and available to staff, students and parents as well.

The first parent information session was small but successful, and we'll keep holding them through the year, probably another three or four throughout the year and we'll try to promote the library through different events and get parents and students in the library so they see it as a communal space, and see what their children are reading.

MARTIN THOMAS

Elementary Principal

Canadian International School, Bangalore India

Martin is originally from Vancouver, Canada and has been abroad in Mexico and India since 2005. CIS recently became the first Apple Distinguished School in India. Martin has a Masters degree in Educational Technology and is currently completing his doctoral dissertation on the use of mobile Apps to promote parent involvement.

Q: How is technology being used in school for both staff and students?

M: We have the range of approaches, from applications and management technology for running the school, and more recently the Bloomz app which is mainly a parent-teacher communication software.

Technology is also being used to explore our school's values, where some of the classes have taken part in the *Be My Eyes* community to provide assistance to visually impaired through the Be My Eyes app. This promotes positive values and also inclusiveness.

What are some of the challenges you've seen in the course of using technology in school?

I think ensuring that all three stakeholders - students, staff, parents - are using technology fluently and in meaningful ways. For example by teaching parents firstly to log in and access their child's data, followed by being able to understand and interpret their child's data effectively, they become part of a community that's learning how to use technology meaningfully, because it's not always an innate skill.

Another challenge is the redundancy of technology - for example you have three apps that can do some of the same things. Some of the software companies are working to reduce that, obviously partly to take some of the market away, and to get a bigger piece of the market.

But I think it's the responsibility of these app developers to listen to their clients and schools, and help us reduce the time we spend on using different technologies and putting more time into teaching and using them effectively.

That's something that Bloomz does, so what they've tried to do is build all these tools - *portfolios, parent-teacher communications, scheduling of conferences* - into one app for elementary schools. This has also taken away the need to teach parents about four to five different apps and we only need to go through one app.

It's always a challenge to get teachers on board with effective practice, for example using it for creativity and building knowledge. If teachers aren't fully aware or fully trained up on using technologies, quite often you'll find that students are ahead of the teachers, so it's about making sure you're doing frequent training.

Another challenge nowadays is safeguarding; making sure kids are using it responsibly. I think parents assume kids are using it safely, but informing parents about responsible use and practices at home are part of the school's responsibility too.

> "...I think it's the responsibility of these app developers to listen to their clients and schools, and help us reduce the time we spend on using different technologies and putting more time into teaching and using them effectively."

Some schools might shy away from the topic and say that's not our job but if the child is up with a device in the room till 11pm and not sleeping, or it puts them in positions where bullying occurs, then it becomes the school's problem because the kids have to see each other in school.
Building a safe community and teaching the skills to be a responsible user is part of the school's responsibility, so that's one more task for teachers, where they need to be trained to be part of that discussion.

Another basic one is always bandwidth, access to bandwidth; reliability of the technology in your school, especially with the cloud playing an important role nowadays.

Has the school had significant challenges with bandwidth?

Definitely. As schools you often can pay for as much bandwidth as you want but in India it's certainly a challenge to ensure that there's reliable service to your area and sometimes the bandwidth that you want is not even there so you have to combine services.

How do you think technology has changed learning, and is helping students prepare for the future workforce?

I think some of the best apps for creative thinking, which follows a constructivist pedagogy and kids are learning and producing together, that's really how the world works. So things like Google Docs or creating a multimedia project together.

If kids have to produce an iMovie project someone has to write the script, someone has to direct, someone has to act - it's public speaking and collaboration. Basically any sort of presentation using devices, these are ways technology is helping them prepare for the real world.

Beyond devices we have a Makerspace with technologies that help with problem solving and critical thinking. We have drones, which allow kids to see and work with them and talk about issues related to their use.

It also provides an opportunity for schools to connect with their communities, to reach out and do some research on the community and how they can improve the community.

What about with respect to the running of the school?

Parents today are using smart phones, so instant messaging has become the more common way to communicate with teachers than by emails or even calling them.

They're are set up to communicate this way now so administratively if they want to take their kids out early or if they want to send the teacher a message I feel a number of them are using Bloomz to do so.

Also, as you can set up events in the app's calendar and invite parents to be involved, when they say yes and their participation is publicised in the app, it sort of gives them

Image courtesy of Canadian International School

some public praise because they're being involved.

We've also gone green in our school, all our roofs have solar panels and we're a 100% reliable on those solar panels for energy.

We're one of the first schools in India to go green and part of that green initiative is taking away paper report cards. Instead we publish them in PDF and put them on Bloomz, and parents have no issue with that. These are some of the positives administratively.

Have there been any challenges with the move towards using more technology and how have you been getting parents on board to support that?

I think one of the biggest challenges expressed to us is their child's behaviour at home and the dependency on technology.

It's a tough balance to achieve, so if we have programmes that kids have to do homework on, what you have is kids saying they have to extend the time, and not really doing the work. Parents end up having a hard time managing the usage at home and limiting usage which is something I believe they want to do.

Training for parents is pretty easy, some programmes might be harder, they're not as intuitive and that's an important piece when you're building software for schools.

Another thing we noticed is with Bloomz is that dads will install it. Most of the time dads are the least involved when it comes to school and here we push the Google Calendar into the app so dads have access to this now too. Whether they communicate or not it's another thing but at least they know what's going on and that's important.

How do you think learning spaces need to evolve to adapt to the ways learning are changing?

We have to make sure children have access to devices because sometimes there's insufficient access. Right now we have one iPad cart per grade level that's shared between two classes, but maybe in the future we might need more. Spaces where children can sit and relax and think more comfortably, charging spaces to ensure the devices are charged, elements like that.

A Makerspace where new technologies are available in general and shared across the school; open spaces where they're free to play and experiment and not necessarily confined to desk and chairs. Making it as accessible as possible and that it's technology that people actually use.

At the same time I think we're beyond the core level of technology and moving towards how can we integrate this into the higher order level structures of the school such as I mentioned, getting the parents and community involved.

It's a young area in research but in the past 30 years **there's a 100% level of alignment in the studies that more parent involvement equals higher achievement of students.** But along that level of involvement there are significant barriers to being involved which is time, ability to come in to the school and energy. That's where technology is filling a huge need right now in terms of increasing involvement.

K-12

NICOLE SARGEANT

Head of IT

Regents International School Pattaya, Thailand

Nicole is a Computer Science and ICT teacher who teaches students across both Primary and Secondary schools. She is the school's virtual learning environment (VLE) administrator for MOODLE. Nicole also provides strategic tech-coaching for teachers to ensure technology is used to transform learning in all classrooms around school.

Q: How do you teach technology, both to staff and students? How can you put technology in context?

N: It is hard to imagine Regents International School Pattaya when it opened 25 years ago and how it functioned without the digital systems and technology that is fully integrated in our school today. Technology is now a huge part of the operational management of our school and is used as a strategic tool to enhance, transform and redefine teaching and learning.

What challenges do you face in teaching technology?

One challenge that I face as a tech coach is the misconception that budget is the only consideration when integrating technology. It's great, of course, if schools can channel a generous amount of their budget into buying high spec and therefore expensive resources, but technology can only be meaningfully integrated if there is buy-in from the community around it.

For example, a teacher with access to only 5 iPads in a classroom who has been empowered to use them through training and support will have far more impact than a teacher with 25 iPads but no desire or knowledge of how to use them meaningfully.

Buy-in comes from training; empowering teachers, parents and students to use the technology with confidence to genuinely enhance and transform learning.

How are you using technology in your classroom to enhance learning? Is technology enabling a systemic change in pedagogy?

Educational practice within the classroom is evolving all the time. Technology is a tool that is used to enhance and transform educational practice. At Regents International School Pattaya, we aim to redefine tasks that were previously inconceivable without the use of technology. We are using the SAMR model to evaluate and reflect on the impact technology is having on teaching and learning.

How is technology making genuine personalized learning possible?

Technology opens up many more possibilities for learning. The vast number of apps, programs and devices that can be used to create content and learn interactively gives teachers and students choice, allowing for personalisation of task and outcomes.

Technology can also help to make intervention manageable for teachers. For instance, using programs like Kognity and Myimaths allows teachers to set and monitor individualised work.

How is technology changing students' learning experience?

Technology opens up opportunities to share, communicate and learn beyond the physical classroom. It allows for learning that was previously inconceivable. For example, digital field trips, augmented reality and virtual reality allows our students to be transported across the planet and beyond. Students can be immersed in the places they are learning about, all from the comfort of their classroom in Thailand.

I witnessed students amazed at art work in Paris that they could zoom in on to observe each brush stroke. You couldn't even look at it that closely if you were actually at the museum in person!

What challenges do you face in using technology in your classroom?

With the increased amount of technology use comes the increased exposure my students have to the dangers of using technology. Although tech was created to help and advance our lives, we are all aware of the negative impact too much technology can have on our physical health and social wellbeing. To tackle this, we ensure that e-safety and digital citizenship is embedded within our curriculum. Parent support is particularly important therefore we provide regular parent workshops to enable them to safely manage technology use at home.

How do learning spaces need to adapt to new ways of learning and new technologies?

Learning spaces should be designed with flexibility in mind. Wherever possible, furniture should be easily movable to suit the changing needs of our learners. At Regents International School Pattaya, the bookshelves in our learning spaces are all on wheels to enable the layout to be easily changed to suit the students' needs.

Spaces should be technology enabled with power points available for charging. When designing spaces for technology to be used, designing for the specific devices currently used should be avoided.

Instead consider all kinds of technology; there may be a shift in your school from laptop to handheld, vice versa or something completely different and your learning space should help rather than hinder future progress.

"Buy-in comes from training; empowering teachers, parents and students to use the technology with confidence to genuinely enhance and transform learning."

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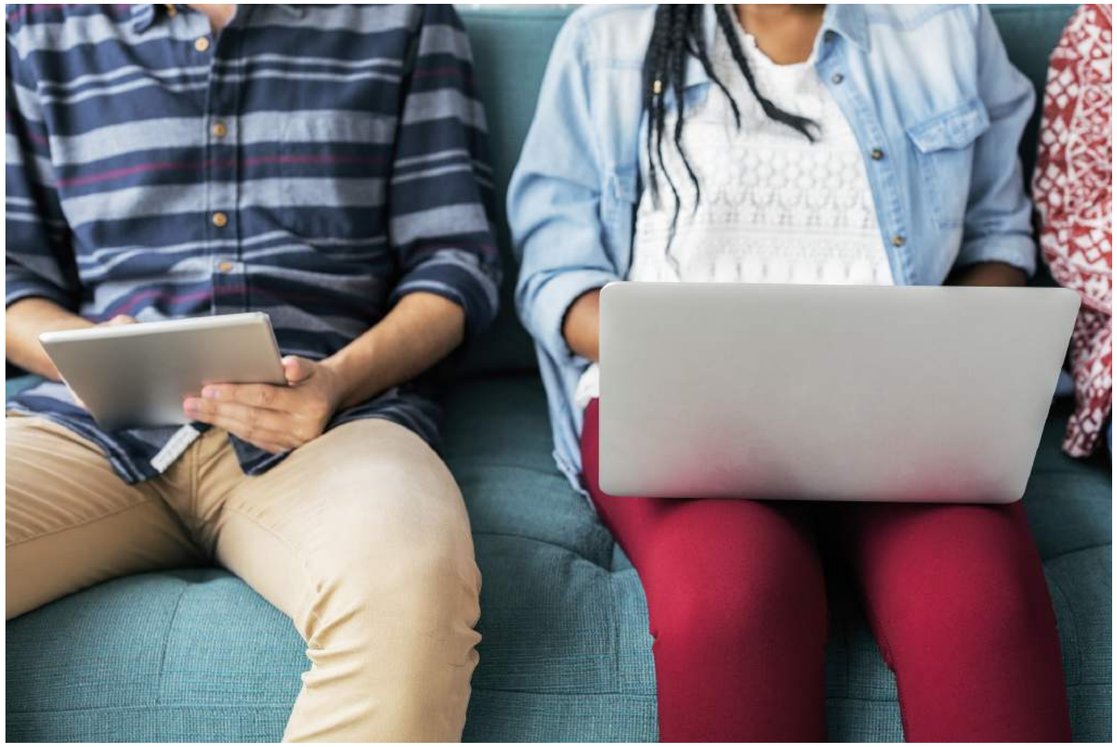


PROF. LUTZ -CHRISTIAN WOLFF

Dean of Graduate School, Faculty of Law
The Chinese University of Hong Kong

Professor Wolff was a founding member of the Faculty of Law (then: School of Law). He has served amongst others as Associate Dean (Faculty Development), as Director of the Master of Laws Programmes in International Economic Law, Common Law and Chinese Business Law and as Associate Dean & Head Graduate Division of Law. He specializes in International and Chinese Business Law, Comparative Law, and Private International Law, and has studied, worked and conducted research in a number of jurisdictions, including mainland China, Taiwan, and the USA.

Q: How do you teach technology, both to staff and students?

L: The Chinese University of Hong Kong (CUHK) has several units which provide technology trainings to staff and students on a regular basis. Most importantly the Center for Learning and Research (CLEAR) and the CUHK Library design and deliver courses at University level on new teaching and research technologies. In addition, Faculties and Divisions organize discipline- and subject-specific trainings.

How can you put technology in context?

Technology has become a very important part of modern teaching and research activities. However, discipline and subject specifics need to be taken into account. Take the example of big data mining. Different disciplines do of course take access to different data sets which requires different knowledge and skills. Special knowledge and skills need to be developed and taught in order to ensure state-of-the-art application.

What challenges do you face in teaching technology?

Technological developments are fast-moving. The pace of development makes it very difficult to keep up to date in particular for non-experts in the field. Furthermore, the teaching of technology to staff and students who work in non-technology areas can be difficult due to the lack of basic knowledge and a resulting tech-aversion.

Furthermore, institutions, faculties and divisions may be reluctant to adopt technological innovation for the same reasons and also due to constraints in terms of resources (money, time and manpower). Constant communication is necessary to increase knowledge and awareness with the ultimate goal to ensure that the most suitable technology is available and used for the benefit of state-of-the-art teaching and research.

How are you using technology in your classroom to enhance learning?

CUHK has long ago initiated a comprehensive e-learning initiative which reaches across Faculties and supports the introduction of all sorts of innovative teaching and research technologies.

The initiative is supplemented by the collection data in order to assess the success of various approaches and to be in a position to disseminate related findings.

Personally, I have changed my own teaching four years ago to the flipped classroom mode by moving lectures online to free in-class time for interactive (deep) learning activities. Accompanying research suggests that this move has been very successful.

Is technology enabling a systemic change in pedagogy?

Technology is definitely enabling systematic change in pedagogy. Technology multiplies pedagogical options and thus moves teaching pedagogy forward. At the same time it must be ensured that technological options are not pursued just because technology is available. In other words, the pedagogical viability of particular technology must be assessed with great care in each case given the particular circumstances.

How is technology making genuine personalized learning possible?

Technological options will make genuine personalized learning possible by allowing the learner to adjust her/his learning process to her/his own special situation in terms of topics, speed, time available and depth of the studies. For this time being broad-scale genuine personalized learning is still just a vision which could, however, become reality in the very near future.

How is technology changing students' learning experience?

Technology-based learning has seen major developments in the past decade, but must still be regarded as being at a very early stage due to the fact that many available options have not yet been put into practice. It would therefore be premature to draw final conclusions as to how students' learning experience may have changed.

However, it is rather obvious changes are taking place. We can see that students become more independent from teachers and classrooms while at the same time the resulting increased flexibility makes the learning experience much more technology-reliant. It will have to be monitored closely if the resulting de-personalisation of the learning experience is justifiable or if such de-personalisation can be avoided despite the increased use of technology.

What challenges do you face in using technology in your classroom?

Technological problems (systems don't work), acceptance problems (students, colleagues, institutions are technology-averse), quality control and governance problems (new technologies in the classroom may require the reconsideration of existing systems) and budget problems (new technology can be costly).

How are you using technology in your back office/administration functions?

New technology is introduced on a regular basis at all fronts to improve the administrative support in our University.

Is it changing how you are running your institution?

The Chinese University of Hong Kong is taking advantage of new technological options in a great variety of ways. Technological developments are monitored closely and updating initiatives to innovate operations are a permanent feature of our day-to-day business. For example, we are experimenting with online meetings, different ways of distance learning and the use digital options to discharge administrative functions. While this makes operations faster and more effective, I cannot observe (yet) that this has changed the management style as such at my University.

How is it enabling new ways of communication with parents and students?

New technologies allow for much faster and more efficient communication with parents and students.

What challenges do you face?

The application of advanced technologies in tertiary institutions leads to two major challenges. First, the interaction at every level becomes much faster leaving much less time in the communication and decision-making processes. Second, digitalized communication means de-personalized communication.

As a result, communication patterns are changing dramatically and it remains to be seen if negative impact, if any, can be addressed or will simply have to be accepted for the sake of efficiency and other benefits.

"Technology-based learning has seen major developments in the past decade, but must still be regarded as being at a very early stage due to the fact that many available options have not yet been put into practice"

How do learning spaces need to adapt to new ways of learning and new technologies?

I interpret the term "learning spaces" as (physical) study venues. Of course, learning spaces need to adapt to the new ways of learning and new technologies in order to be able to offer state-of-the art, i.e. perfect learning environments.

How do you see the use of technology at the university level helping to prepare your students to join the workforce of the future?

Technology innovation is nowadays everywhere. It is one of the main tasks of tertiary institutions to ensure that students across disciplines are able to act with confidence based on advanced knowledge and skills in technological advanced workplaces, i.e. to be successful in a constantly innovating world.

How is technology helping your staff to upskill themselves so that they can keep up with the changing needs and learning methods of students?

The Chinese University of Hong Kong uses a great variety of online tools to train teaching, research and administrative staff in relation to different topics. Technological options are also used for knowledge transfer purposes, i.e. to disseminate research output to the non-academic public.

TERTIARY

ANA HOL

Director of the Academic Program
(BCompIS and BInfoSys)
Western Sydney University

Ana's research interests are in the areas of Information Systems, SMEs (Small and Medium Enterprises) Information Technology use, acceptance and adoption; eTransformation and eCollaboration of the businesses within developed and developing countries; Information Systems and applications for education; social networking technologies; process optimisation and knowledge management. Ana is a member of Enhanced Living with Information Systems Research Group and an associate member of Telehealth Research and Innovation Laboratory. As a part of Ana's PhD research study, she developed eTransformation guide methodology for the SMEs (eT Guide).

Q: How do you teach technology, both to staff and students?

A: Technology that is current today, may not be in five to ten years' time. Therefore, when teaching technology, it is important for it to be tailored, so that essential building blocks are learned. This way students are given opportunities to acquire essential skills in order to apply the knowledge gained in the ever-changing technological domains.

When teaching technology, the aim is to provide students with solid foundations, so that in the years to come, they can utilise the knowledge acquired and apply it to new innovations.

For teaching staff, it is important to ensure that they have adequate exposure to technical advances and that they are given opportunities to engage with industry representatives, attend conferences and workshops. It is also essential that staff are supported and encouraged to engage in continuous professional developments and evaluations.

How can you put technology in context?

By making it relevant and applicable, technology is placed in context. Students need to have a deep understanding of what the technology can provide to each industry domain, as well as what its limitations are. By having this insight, it is possible to put technology in domain. This can be achieved by utilising simulation activities that mimic real-life scenario settings. This is enhanced when students are given opportunity to interact with businesses directly.

For example, students may be given opportunities to visit companies, observe day-to-day operations and engage in discussions with business professionals. For final year students, this can be applied to real-life business projects where students, with the guidance of academic supervisors and industry mentors can work on identifying solutions to challenges faced in the industry today.

What challenges do you face in teaching technology?

In the current age, there are a number of disruptive technologies that, if applied correctly, can bring immense benefits-while if misused can bring immense threats. Not all of these scenarios can be demonstrated and practically learned about in class settings.

It is evident that a student's understanding of a technology which they are learning about, is strengthened when they practically apply it. This is often done via lab and tutorial activities. In some instances, students may also engage in industry-run projects.

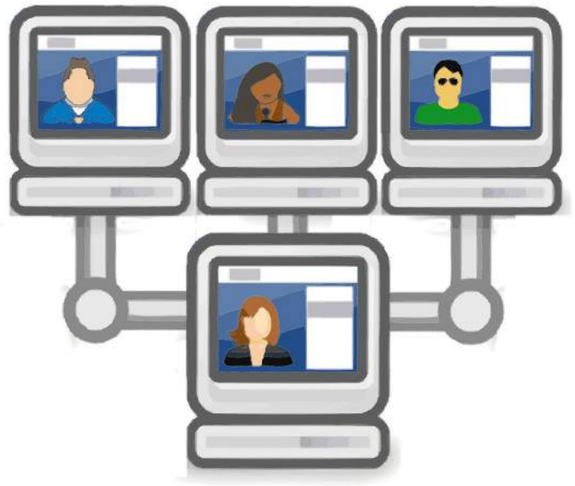
However, the uncertainties associated with the integration of disruptive technologies,

makes them a challenge to teach to students, as it is not always easy for them to envisage how such technologies relate to the current infrastructure. While teaching disruptive technologies can lead to much academic excitement, it is important also to attempt to provide students with insights into their applicability and associated challenges.

How are you using technology in your classroom to enhance learning?

Learning Management systems, simulations, robotic integrations

Is technology enabling a systemic change in pedagogy?



Technology is definitely changing the nature of education. It is opening new avenues for teaching content management, data exchange and online interactions. Consequently, new learning and teaching models are being developed. Some examples of these are the interactive group-based learning and teaching activities that allow for data integration, online collaborations and learning and teaching via simulations.

It is important to note that introductions of new technologies often require changes to learning and teaching styles. Utilisation of simulation scenarios-like those developed by book publishers or corporate vendors, allow for scenarios to be learned in an online environment. This mode of teaching provides 24/7 access to the material and gives students opportunities to be self-guided, develop critical thinking and learn how to solve business problems.

In University settings it is also essential to provide students with face to face and/or online support, where they are able to gain consultations and interact with teaching staff, in order to learn the required concepts.

How is technology making genuine personalized learning possible?

Technology is enabling learning and teaching activities to be monitored and tracked. Students' progress can be observed as well as their ability to meet the set requirements. Consequently, teaching staff are able to monitor students' progress and accordingly provide additional help or extension activities when required.

Technology is also allowing artificial intelligence integrated simulation activities to be developed, which have progressive journeys and scenarios, allowing students to follow real life cases and, based on their gained knowledge and skills, work through real life problems, make decisions and identify the most suitable business solutions.

How are you using technology in your back office/administration functions?

Technology is changing and impacting the ways in which teaching material is delivered, how students interact with it, how marking of assessments is completed, and how student progression is being tracked and managed.

Back office systems have allowed students to have access to the materials 24/7, have enabled interactions and exchanges of data across locations, and have given opportunities to students and staff to engage in collaborative activities both online and offline.

"However, the uncertainties associated with the integration of disruptive technologies, makes them a challenge to teach to students, as it is not always easy for them to envisage how such technologies relate to the current infrastructure While teaching disruptive technologies can lead to much academic excitement, it is important also to attempt to provide students with insights into their applicability and associated challenges."

Communication has also been expanded to allow students to collaborate internationally. It has encouraged engagements and interactions with company representatives and world renowned researchers, who are able to, via technology video links like Zoom and Skype, to share their knowledge and skills with students.

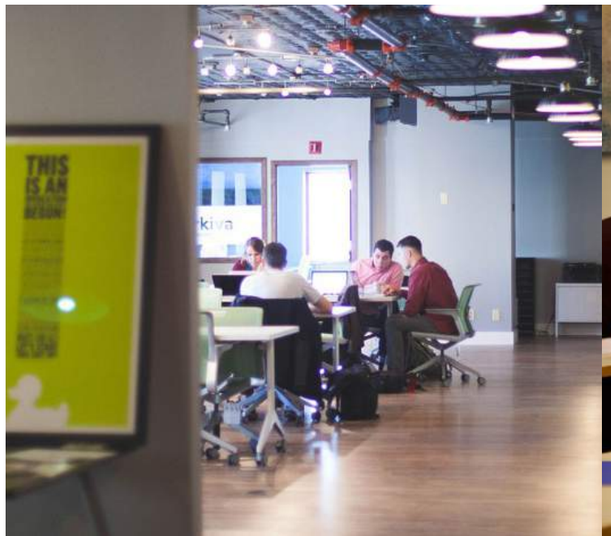
Balance between the face-to-face and online deliveries is essential for the success of the development and education of new generations that are required to have skills to network, engage and collaborate both face to face and online.

How do learning spaces need to adapt to new ways of learning and new technologies?

Modern learning spaces must provide an opportunity for students to engage with technology, as well as be able to interact with one another. By doing this, students are immersed and more engaged into the theory they are learning because it is practically applicable.

The traditional models of teaching were focused on frontal teaching whereby a lecturer spoke to an audience of students. These models prevented student interaction and engagement. The classrooms of today are being adapted into teaching pods which encourage students to interact in small groups, work on activities, innovate and practically apply theoretical knowledge in real times.

This model also enables interactions and collaborations between the participating students and the staff who may be located in the same or even different locations.



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SAMSON TAN

Head, Centre for Innovation in Learning
National Institute of Education, Singapore

Samson helms innovation in learning at the National Institute of Education (NIE), an autonomous institute of Nanyang Technological University (NTU). At his vantage point, Samson advises the Teaching and Learning Committee and ICT Governance Committee in awarding grants for learning innovation projects. Prior to joining NIE, Samson was involved in the SkillsFuture movement at Republic Polytechnic, spearheading the lifelong learning and workplace learning initiatives. He worked closely with the Logistics, Hotel and Biomedical sectors in providing research, consulting and training in workplace learning.

Q: How do you think technology is enabling teachers to teach better and aid their professional development?

S: The last time we talked about e-learning, its focus was very much on digital enablements of learning. But with Industry 4.0, it brings about a confluence or convergence of new technologies, and in doing so creates not just new challenges for educators but for everyone. We're placed in this flux of changing and catching up with how technology is changing education.

It's gone beyond just digital technology, and if you look at technology in all directions, for example Big Data, Internet of Things, Cloud Computing, and you also have Artificial Intelligence, Robotics.
All these big pieces bring about a lot of uncertainty on how it'll affect work, and if we trace it back, the way we'll have to train people for work.

So while that will be a challenge there are also opportunities and it's about bringing better learning experiences for students too. One example can be the collection of data. A lot of times it's quite onerous to convert the data into something useful for teachers in their learning but now if you combine it with cloud, big data management, there's a quick analysis of the data which can be pushed to mobile devices.

It also includes a learner analysis or trends on how the learner is performing and from there you're able to have greater insight to the phenomenon you're studying, and you can draw conclusions on that so we see the proliferation of the IoT platform in terms of data collection and analysis as being applicable to education as well.

Apart from trainee teachers are you also working with current teachers for their professional development?

Yes, although we have many courses to prepare students to teach, we cannot ignore the teachers who are already in school. The Ministry of Education has that in place and is working with agencies such as Singapore Academy of Teachers and we also work closely with them to see what are some of the courses we can teach to help these teachers who are already in school.

We cannot just prepare the new teachers because they're smaller in number than those who are already teaching so we also have courses to let the teachers in school come back and learn how to integrate IoT technologies into their class. It could be science, environmental science, geography or sports- related subject matters, so it's multi-faceted and we need to look at it from a holistic point of view rather than just new teachers.

In your opinion what are some of the skills that teachers will need in order to keep up with the way technology is changing and also meet what their students will require to become in the future?

How we look at it is - this is Education 4.0, we're already in it. People like to talk about the future of learning but well the future is already here. It's already impacting us and we need to get over that quickly, and acknowledge that the role of the teacher has changed.

We cannot just be telling students what to do because content is evolving so quickly, so instead of just teaching content, it should be teaching them how to learn, learning how to learn, and at the centre of that is creating an excellent learning environment for students. The role of the teacher is shifting to become actual designers of the learning environment that best meets their students' needs.

When I say learning environment it's not just the physical space, neither is it just digital but it's a blend of both, and at the same time considering the social and cultural context the students are in and blending them together. If you ask any seasoned teacher you find that they can be teaching the same thing to two different cases but the kind of dynamics that you find in both classrooms can be very different, even within the same school.

So as professional teachers we need to be cognisant of that and design the learning environment based on what suits the learner best, in a way that's learner-centreed approach. Secondly I think it's important to recognise that teachers aren't the centre of the stage, but facilitators of learning. Learning is a

“We cannot just be telling students what to do because content is evolving so quickly, so instead of just teaching content, it should be teaching them how to learn, learning how to learn, and at the centre of that is creating an excellent learning environment for students”

very social thing, so students will have to co-construct their knowledge together.

It’s very difficult especially when we’re moving towards this new world, many of us no longer have that monopoly over knowledge so it’s important for both students and teachers to develop capabilities in co-creating knowledge and skills and be quick and humble enough to ask for help when needed.

Also, the focus of learning cannot just be the cognitive development of the learner you have to look at aptitude and attitude as well, so because students look up to teachers the opportunity arises for us to help them develop character as well, and especially for higher education when they go out to the industry, there will be certain ethics and testing of abilities that govern the industry so teachers become the mentor and role model for that character.

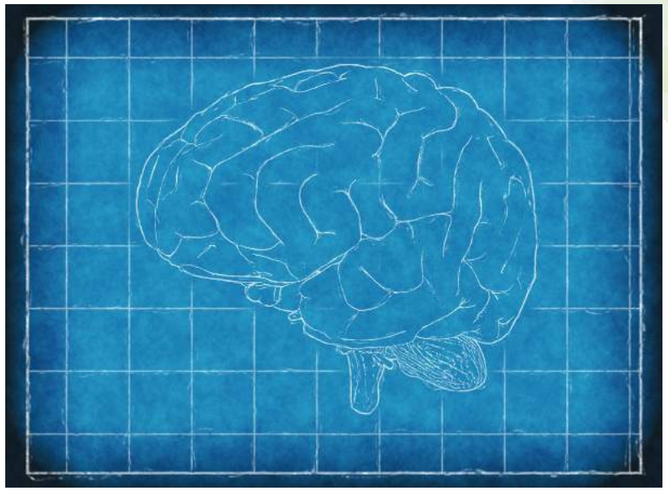
You mentioned the use of technology and how its integrated in increasing innovation in learning, are there challenges in getting teachers to use the technology and how have you guys tried to overcome the resistance?

More often than not, there will be some resistance, and it happens regardless of age. Some might think that the younger teachers are more tech-savvy and more so than the older teachers, but that’s not entirely true. Young people can be great consumers of technology but it doesn’t necessarily apply to them using it in their professional lives so a lot of times one of the easiest ways to reduce that type of fear of adoption of technology is to make it familiar and contextualise it.

For example just smart phones, we do so much with it, and when you start to think about the implementation of technology, we think about it from the user experience first, to make it as easy for them, and we want to make it as easy to use as a mobile phone. You don’t need a manual to know how to use it, so that helps to reduce the fear of adopting new technology and of trying so we’re always thinking about that.

Another example is we adopted Google Suite, and it becomes a dashboard for teachers to use, and one way we made it easier for teachers was through a single sign-on process, so the same password across all the applications, and that might be a simple measure but it removes the tedium of having to remember multiple password as that can be a big turn-off.

We’re in an age of social media and apps where everything is easy to use, so when we’re designing tools or apps for teachers to use we have to remember that they’re very attuned to this ease and so keep it in mind so as to reduce the fear and resistance.



It’s a very human thing to be apprehensive about new things so because of this more often than not when we design something with that in mind for the teachers we get quite positive feedback.

It’s been mentioned that schools or education institutes can tap on the experiences of older teachers in order to help younger ones in their professional development and improve teaching outcomes, but at the same time these older teachers also need to undergo training to learn how to use new technologies. How do you think they can combine the learning of a new technology, with their experience in order to maximise the outcome?

If you look at experienced teachers, the approach they have is quite different from younger ones, Younger ones are new and they’re trying to put theories into practice whereas for experienced teachers, it’s almost second nature to them, whether they’re planning to use technology in their class or somewhere else, they’ll jump ahead a few steps in their mind and get to the outcome they want

A lot of this is what we call tacit knowledge, just like a very experienced chef, it’s all happening in the mind when they jump from point A to E. What a good mentor to younger teachers has to do is be able to unpack the steps, and break it down for their mentees to know the steps and their thought process when they’re planning, and that will help younger teachers to tap into their thinking.

Basically it’s about making their thinking visible, whether you’re introducing a technology or using technology to improve pedagogy and the learning outcome for the students.

We’re also interested in deep, sustainable learning, so we know that the idea is to be able to have the student articulate their novice point of view of the knowledge and then the teachers will know the gaps in knowledge and provide the scaffolding to fill in the gaps. Subsequently they then provide the opportunities for them to co-construct their knowledge and build it together, so it becomes a very dynamic thing, not just engaging but effective as well.

I think many experienced teachers will be able to do so, it’s just how do you unpack that to the younger teachers, and how to have the technology platforms to enable that, and that’s our job at the centre.

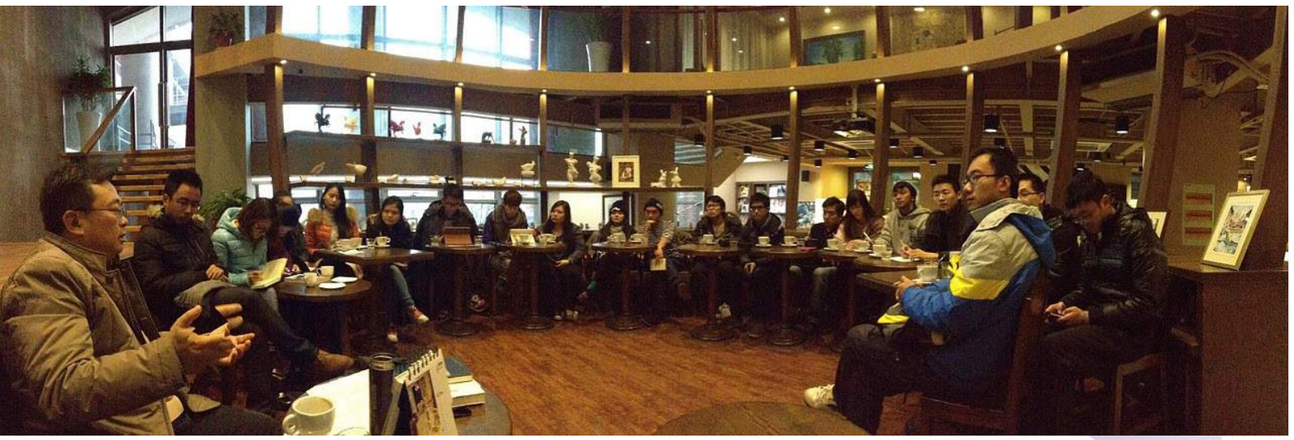
How do you think teachers can best use technology in the classroom to improve student learning outcomes?

I think it comes down to the beliefs you have in teaching and learning. So if you believe that

teaching and learning is about being learning-oriented and student-oriented, you actually do more learning than teaching, and if the technology is being used to create an optimal learning environment then the technology has been well used.

An example would be the physical classroom, if you want to enable students to be able to co-construct their knowledge then you may want them to have physical furnishing that allows them to do so. If the pedagogy is collaborative learning, then you must be able to do that. If your pedagogy is enabling reflection of learning, then the environment or technology must be able to help with that.

Another example is microphone and their ability to convert text to speech. If you can record whatever you're listening to perhaps



a lesson or a recording and convert it to text, you're then able to group information together in a way make something invisible to visible. That helps with both learning and information retention. So some of this technology may not mean much in teaching on its own but if you apply it like the way I just explained then it becomes effective.

How is technology helping to make genuine personalisd learning possible for students?

I think for a long time we've had products out there that's based on adaptive learning. For example they assess the students at the entry point and then recommend the level that they should start at, and more and more I also think data analytics is helping in accurately assessing that level of readiness.

There are many levels but the one I'll use is prescriptive analytics. For example a student is going through learning and the machine is collecting these data about them. If they become at risk of failing or not doing well, the machine can point it out very quickly. Both the teacher and student can take steps to address the problem, and intervene at the appropriate time, rather than having the student take the exam and get a rude shock when they don't do well because they didn't grasp the concept correctly.

That's how learning can become personalised for students, and when we look at machine learning or AI, it's enabling a lot of this analysis to be done very quickly, as long as they are taught what to look out for.

In terms of challenges, have teachers you worked with shared the challenges they face when it comes to using technology in the classroom?

I think fundamentally it's about knowing, most of our teachers are well-trained in the pedagogy but you cannot enforce pedagogy from the use of technology. We look at consumption as one but we don't mix work and personal life even though more often than not technology blurs that line.

So what we need to do is to look at the technologies that are enabling better learning, and teachers don't have to be resistant to that and if they don't have that knowledge there's avenues they can use to help themselves, be it colleagues or going for training.

As mentioned earlier I think there's no more monopoly of knowledge, getting training can shortcut a lot of the learning pains and learning curve. That's a reason why we emphasise a lot on professional development for teachers, so they're able to use the technology effectively, and we look at technology as an enabler, and not something new you have to do.

Sometimes the solution to a problem isn't necessarily a new technology, it can be a current technology, and how it's changing the way you teach and learn. Some of the new technologies may be very new and useful for industry, but may not be able to be used for teaching yet. My job then is to scan the horizon and provide options for teachers.

Lastly, on the future of learning spaces. How then should learning spaces evolve in order to adapt to future changes?

Credit/ Flickr - Liverpool School of English

Learning spaces is a multi-dimensional thing and goes beyond the physical learning space. How you organise the physical learning space needs to be based on your pedagogical approach. An example can be toggling from a direct-teaching format where students are facing their teacher to reorganising the setting for group discussion in a minute, and back again. If technology is able to enable that, that's one way in which its supporting learning.

White boards for example, a lot of vendors like to sell them in digital format and it tends to be limited to that particular space and time. But a good whiteboard should be have a multi-modal approach, so for example if someone cannot be in class, you can use a mobile device or Google Hangouts and that person can still be in class when they're not there physically. At the same time all this collaborative group work is being saved in the cloud, so it's a matter of - *how are you designing the learning spaces to enable physical, digital and social learning?*

PROF MIKE KEPPELL

Pro Vice-Chancellor, Learning and Teaching
Taylor's University

Mike has worked at eight universities, held formal leadership roles across all institutions, and been a full Professor since 2007. With a strong research and scholarship background in higher education, educational technology and innovative learning design, he has edited three books, authored over 100 peer-reviewed publications, and worked on research projects valued at $AUS16M. Passionate about learning and teaching, he have been an academic developer and designed institution-wide professional development with a focus on learning design.

Q: How is technology being used by both staff and students at Taylor's?

M: For staff we're going to be looking at about 10-30% of online teaching using our learning management system (LMS) which is powered by Noodle. We're looking to create rich interactions in that space, and using the space for discussion forums and collaborative spaces to work with staff.

I see in technology providing a richer range of spaces for learning and for teaching with the students, and we're encouraging that. We've developed a number of MOOCs (Massive Open Online Courses) that go to the outside world and we've tested our skills in terms of the technology and providing MOOCs.

With staff I think the biggest issue is changing the mindset - *is the online environment a legitimate space for teaching*? Yes it is and it's been proven.

The blended environment would be the best way to go and what I mean by that is 10-30% of a module, and things like the flipped classroom is a good example.

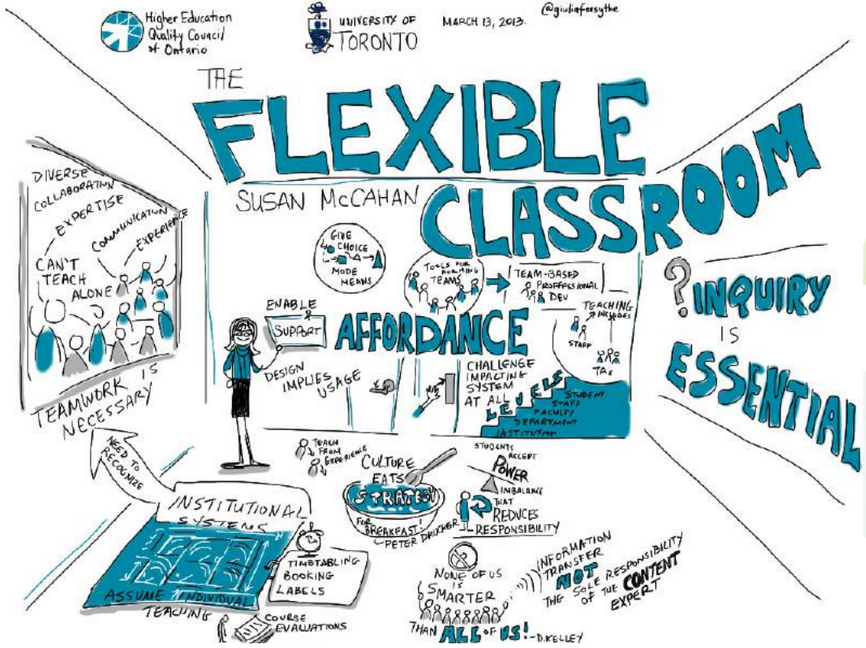
"A learning space is a space that motivates learners, enhances learning and allows teachers and students to optimise their learning experience and encourages authentic learning and teaching."

One of the things we found as well is the physical spaces with collaborative tables and video screens in the classroom. Students can brainstorm or staff can use the space to teach, and it promotes collaboration and also gets the students to use technology in a seamless way.

With students what we do is actually the reciprocal. There's good wifi across the university, physical spaces where they can interact with the virtual spaces - they can collaborate online, look at the resources needed in the LMS and participate in forums, blogs as well as have formative assessment.

In some ways it's part of the ecosystem of learning and teaching. It needs to be there not just for now but for the future. When they've graduated and have a full-time job, and need to undergo professional development, they'll need to tap into different professional learning networks, so we should be teaching them not just for now but also the future in the use of technologies to aid their learning.

What I look at in terms of technologies is the affordances for both students and staff. The idea of *"What are the action possibilities for that technology and how you can use it for what you're trying to achieve in learning and teaching?"*



Credit/ Flickr - Giulia Forsythe

That's really the approach with our students and staff so the action possibility for example for discussion forums can be peer-to-peer interaction or peer-to-teacher. The affordances of that space lend itself to feedback, collaboration, getting different aspects the same if you're looking at other technologies.

In that sense I think in today's school climate, you can't teach and learn without the use of technology, and it's going to become more prevalent.

The next question is how to use it appropriately and how can students judge the appropriateness in how they're learning in that environment, and not get distracted by for instance social media.

What other challenges have you faced when it comes to introducing new technologies, or new software to your staff and students?

I think the first one is mindset - *how do we use technology for good educational reasons?*

Second is using the space appropriately to achieve an educational goal. For example if your goal is to have students cultivate collaborative and communication skills through project-based learning, what you need to do is work backwards and get them to use the tools that will encourage those skills.

It can be report writing or use of social media in a particular way. The key idea is that the pedagogy has to drive the technology. There are lots of choices out there but it gets back to what is the learning outcome we're trying to achieve or the pedagogical goal we're trying to achieve? You then work out the assessments , pedagogy and the teaching and learning that will support that.

Students will then be taken on that approach, and it needs to move from teacher-centric to student-centric. They need to have the technologies and tools to use in their own way to achieve those goals, such as working on their laptops, with other students in a virtual environment, synchronous or asynchronous chat. It's got to be a very outcome-based and pedagogy-based approach to using technology

How do you see technology enabling a systemic change in pedagogy?

It's an interplay because if technology is driving the pedagogy then we need to have different technologies with different capabilities. It's a cyclic approach and we need to recognise these technologies. What I try to do is try to explore different technologies for learning and teaching, and see what their affordances and capabilities are.

We have to have an eye on each of them, look at the pedagogy and then the technology and think, "*Technology is moving very fast, what are the benefits of that, and how can we use them?*"

So technology is driving pedagogy and vice versa, but the technology is always changing and we have to be aware of the different spaces that we can use for teaching.

What we have to do is make sure we're not too distracted by the apps and keep that focus on the pedagogy, but be aware of the different technology spaces. The pedagogy needs to drive the technology use, but technology provides many more spaces and ideas to help us choose pedagogies that can be enriched by them.

From your experiences in using different technologies, how do you think it's making personalised learning possible?

There are two ways to look at personalised learning. One approach is that we work out the types of skills and aspects the student needs to cope in a very technology-driven world. Things like being able to learn in a face-to-face class using technology, or a full online or blended class.

We can empower the student by the interactions we create and teach them particular skills. Things like self-regulated learning, thinking about assessment from a personalised viewpoint where they can use different technologies in their assignments to learn about different topics.

The other side is using things such as adaptive technology where you can provide pathways through where students start micro-modules, and how they answer the questions would place them on different pathways to give them the pathway that's best suited for them, based on their knowledge at that point in time. That's very powerful.

I don't think it's a whole picture, but it can become diagnostic as well, where technology can play a role in intervention when it sees a student needing more help in a particular topic.

I've been leaning towards empowering students with knowledge, skills and capabilities so they can become a personalised learner. That involves cultivating a lot of soft skills or transferable skills, how do you get them to be curious, asking questions all the time; how do you get them to think about creating their own prescribed pathways through a degree programme?

I think this is where we're going with our programmes worldwide where students will come in and say *"I want a programme that can do ABC and I want it designed this way. I don't want to do exams, I want to do rich authentic assessment tasks and I want to use different types of media that I would use for doing these."* So I think we can empower the student to be a personalised learner because that's going to be better for them in the future.

The other side is using personalising the technologies for the student. Things like AR and VR are going to be very important where we can have personalised journeys and is tailor-made for the students.

> **"The pedagogy needs to drive the technology use, but technology provides many more spaces and ideas to help us choose pedagogies that can be enriched by them."**

With all these technologies and tools, what challenges do you foresee?

Again the mindset is the first one you need to overcome. It can be quite uncomfortable for teachers to teach when there's no student in front of you and this is something felt worldwide, it's about this idea of letting go of control and not having students in front of you when using the technology.

The second thing is getting people to look at technologies in a skeptical way, and to assess how they can use it for the learning and teaching interactions, instead of just adopting the latest technologies.

They need to have this lense of affordances - *what does this technology allow me to do that I couldn't do before?* If it allows me to teach law or medicine in a better way then you should adopt it but you have to look at it with a healthy skepticism too.

The other challenge is to get staff to play with new technologies when they come out, so they can see how they work and how it could be utilised.

An example is MOOCs, they're still being used, but the fact is if we didn't play in that space and see what a MOOC could do, and it's moved on two or three iterations, we wouldn't have been able to see the capability of it as a teacher.

The challenge for students is bit of the same. However their mindset needs to change from not necessarily adopting the technology, but being more discerning of the technology. Looking at it from their point of view, that they don't get too distracted by too many sources.

When they interact in the social media environment, their spaces are in the social sense but they have to have the knowledge and belief that they need to own that space and be responsible for what they're saying, especially when they're going for future jobs.

Another thing is that because social media can also be used for school (for example Instagram for a photography assignment), they need to be mindful that they can't keep the same mindset and it's the same social environment they're posting in when they're posting for school.

They also need to play with technology, but not get distracted and ration their time for social use and learning use.

How do you see the use of technology coming in when training new teachers and developing new skills for current teachers?

What you have to do is show that technology can help them do their job in a better way so they can teach more effectively. I like to say the blended learning approach teaches students not just for now and the future, but also the way you teach could be enriched further by the richer range of virtual and physical spaces.

You've got to find the relevance that you can help teachers with and you've got to then be specific with what they're trying to teach.

There are usually three groups - the early adopters who'd usually take it on without being asked, the middle group who are a little bit more skeptical but they could be convinced with right dialogue and working with them to show that technology can be used to achieve their educational goals.

The group's that the most skeptical, sometimes they're the ones that if you find something that's very relevant with them, they become true believers and have that 'wow' moment, and see the rich outcomes they can achieve.

So there are a wide range of approaches with staff, but the key is training them in the skills and giving them the opportunity to use it and providing feedback. You're working with clever people who like to learn, but they might not like to feel that they're not as good in that particular environment.

Therefore you have to create a very safe environment for them to explore the technologies as well.

How do think learning spaces need to evolve?

In terms of the physical environment, you need to have a space that allows certain pedagogies so projects, solving problems, collaborative learning, it needs to have technology there so students use it to do their work.

The space needs to fit with the pedagogy but also with the technology use. You need to then mirror that in the virtual environment, so you're looking at spaces to achieve certain pedagogical goals, but you always need to be using the technology in the physical space.

There are a wide range of ways you can look at the spaces. *How does the physical space and technology interact to affect learning? How does technology get integrated to support that learning, and how can students interact in the virtual environment, or follow up online after leaving the physical classroom?*

Getting the right choreography for a discipline for a module is the beauty of what were doing with the technology and spaces so something in medicine would be different from something in education, to law or engineering or performing arts.

It needs to be integrated to come up with the right mix, so learning spaces needs to allow the use of technology for both teacher and learner. A learning space is a space that motivates learners, enhances learning and allows teachers and students to optimise learning experience and encourages authentic learning and teaching.

It needs to have both physical and virtual capabilities and you need to choreograph how they'd work in relation to each other, the discipline, and the learning and teaching approach you're using.

VOCATIONAL

LOUISE ROBINSON

Executive Director, Vocational Education
RMIT Australia

Louise's role in the executive strategic team at RMIT University involves planning for and advising on developments in the local, national and international TAFE / VET/Skill sectors. . Louise founded the RMIT Skills & Jobs Centre which was launched by the Minister for Skills in May 2016. Recently she was awarded an International Specialised Skills Institute Fellowship for 2017 to research how RMIT can provide better pathways into employment, education or enterprise for economically, socially or regional disadvantaged cohorts.

Q: How is technology playing a role at RMIT?

L: Supporting our students and staff with modern technology and equipment is important to RMIT. We are currently embarking on an ambitious digital transformation which underpins much of our strategic focus for next year.

For vocational education it's particularly important to assist our students and staff to learn about technologies and to understand the challenges and the changing nature of what technology brings to the workplace.

Currently we've got a project which involves setting up a Center for Digital Excellence which looks at current workforce roles and the ways technology is changing these.

It also identifies emerging skills, and to understand the impact and training needed to upskill the workforce, knowing that technology is constantly changing, training needs are also evolving.

How are you teaching technology to the staff and students?

Some examples of teaching technology to students - we've got an Advanced Manufacturing Precinct, which is equipped with state-of-the-art technology and provides opportunities for hands-on experiences with current technologies.

Another example which is more recent is the opening of our new Academic Street; a media precinct with arguably one of the best television studios, and training facilities in the Southern Hemisphere.

In these facilities students are trained through practical projects with industry practitioners, and programs as well as being connected to industry partners who provide opportunities for places and future employment opportunities. In some cases, we've had industry come in and use the media precinct to teach our students and their staff.

Recently at RMIT we migrated our Learning Management System (LMS) to a new platform which is exposing our staff to new digital opportunities. This creates an opportunity

RMIT New Academic Street/ Image courtesy of RMIT

for our educators to think about our approach to teaching in contemporary ways. So it's not just using the technology but how we're utilising it to enhance our teaching.

Have there been challenges in the process of migration?

One of the greatest challenges with technology is that it's constantly changing. For any organization, technology represents a large investment.

On a more practical level for our teachers who are busy teaching and working with students we need to be mindful of their time as well as utilization for teaching enhancement.

Specifically, what types of technology are you using at RMIT and how are you using it to enhance the learning of your students?

The main example I'll use is our new global learning management system. This technology opens up the possibilities of us really changing the way we teach as well as manage our student learning experiences and administration.

We are trialling micro-credentials which means developing short, sharp skill sets. Over the last few months we've also really looked at industry-based training modules where we are delivering into industry, through content made available on the LMS which focuses on our students on being trained and assessed at the workplace.

That's really important for a workforce that's not coming into campus all the time, so something they can take with them into the workplace. The learning content is a resource for those that need the information but in short, concise bursts because they don't have the time to sit down for a long session or come into campus.

The way it's set up helps students to see a whole series of modules that take between 15 minutes to half an hour; they can pick and mix the modules to fit with their schedules. For students doing shift work it might be during tea break so they can learn on their own time when it suits them rather stopping work to come to campus.

You mentioned microcredentials earlier, can you give a specific example of how it works, short bursts vs a long-drawn course?

Well what we're looking at is RMIT micro-credentials and the tests are based on attaining micro-credentials. RMIT is one of the leaders in vocational education and it's meant

to test what's required at the workplace so the individual tests are meant to support their learning.

For example, we have an industry partner, and the CEO has made videos to introduce the program and engage their staff. The students earn what we call micro-badges which the students gain on completion of a skill set. The students can use that badge on their LinkedIn or Facebook profiles. Anecdotal feedback is that the students can get quite competitive to collect as many as they can!

The students can keep working on their skillsets, taking tests, self-assessments, and they can set their direction for a number of competencies whilst they are in the workplace. We find that that actually engages them better because they can assess their learning along the way.

We find that students are more engaged and driven because it's positive reinforcement with rewards.

How do you see technology enabling a systemic change in pedagogy?

Using technology compared to traditional methods reinforces learning outside of the classroom. People can learn or refresh their learning anytime and anywhere, so there's more flexibility to learn.

We can teach people in the workplace, so they don't have to come in to study. At the same time though we're also looking at some ways to encourage students to come into the campus because we don't want them feeling lonely or isolated so we're actually trialling some VR and AI applications to support the students in their learning and increase their engagement.

The risk that we run is that if everyone is doing their own thing using technology, the collegiality and working with peers is lost, so we're doing some things now to assist our students and staff to engage with the university and their peers in new ways.

I guess there are collaborative projects as well that students have to take on during their course?

Yes and that's an interesting point because through Canvas we can see where they are engaging and there is obviously opportunities for group work and assessment, through technology.

Not all students like learning on that approach, so we're mindful not to completely push down the digital experience but why it's good doing it at RMIT is that we can test it in the vocational space and then because we have shorter and sharper courses, and then we can roll it out to more cohorts.

So would you say that technology is helping to making learning more personalised?

Definitely more personalised. Technology really helps students learn anywhere and anytime and it reinforces their learning. New learning spaces also include the mobile environment as well as the workplace which to us is a fantastic improvement compared to more traditional types of teaching.

How do you see your use of technology in the school as helping your students or equipping them with skills that are necessary for a digital workforce?

Some courses lend themselves to technology for example like engineering or computing. For others it's more of a journey where we're using technology to support their learning because vocational is still competency based.

We feel the test cases we're currently working on using technology to support student's learning through a flipped or blended approach are positive. With vocational training students still need to be able to demonstrate their skills.

Arguably, learning resources are now online so students can access it anytime and anywhere.

Through the work we're doing at the Centre for Digital Excellence we're actually actively researching current jobs and roles and what are the digital skills required. The resulting focus will be identifying the gap and developing specific training sets because our jobs are constantly changing, let alone new jobs that have yet to be created.

That project we're working on just launched with two regional teams and their industry partners. One of the industry partners instance is an agricultural manufacturing company and they're using technology to improve their production capacities.

We are collaborating through the network to identify what equipment and technology they're using and then the skills with which will be needed by their workers so they can be trained.

"The risk that we run is that if everyone is doing their own thing using technology, the collegiality and working with peers is lost, so we're doing some things now to use technology to find people to engage with the university and their peers in new ways."

Do you see any challenges when it comes to teaching and learning technology?

I think so, we have to be mindful that some students aren't as digitally adept so using technology might be a challenge. At RMIT we have students of mature age who have varying technological skills.

We also have to be mindful of issues like privacy as and security. We have policies and procedures to reduce the risks as well as invest in upgrades.

How are you trying to help those who are resistant to learning digitally?

To help with those who might need assistance, RMIT offers a range of support services inside and outside of the classroom to increase digital literacy. For instance, there are student mentors, staff, and homework clubs. Additionally, the way we can structure learning including blended learning, flipped classrooms and face-to-face peer learning to provide support.

Our LMS allows students to take some self-tests so once they learn they can do self-evaluation and they can direct where they need to spend more time.

You mentioned learning spaces becoming less relevant, because technology is allowing students to learn wherever. With regard to the formal classroom, how do you see it having to evolve to adapt to the way students are learning and also to technology?

For many students coming into university there's a clear distinction of why they're coming to learn, and technology is supporting them. Classrooms might be less relevant but there's still a need for peer collaboration

Libraries have also changed incredibly where people can learn on their own. But things like networking, student clubs are still important so it's the balance that I think will help students to learn and engage. We still want them to feel supported and want them to come in.

In that aspect there is still room for networking and learning where we've a made a lot of engaging spaces for students to come in and hang around so that they feel a part of the community and not feel isolated. Therefore the role of the university is to provide great spaces for learning and giving them support

How are you using technology in the back office and administration of the school?

We use technology a lot as an organization, so the full range of business programs. We have a huge number of databases which increases our efficiencies.

Another thing is for vocational education we need to do a lot of government reporting, and keeping secure, accurate administrative records is part of the university's responsibilities.

DR ONG ENG HONG

Director of Academics, SUTD Academy |
Director of Office of Education
Singapore University of Technology & Design (SUTD)

As Director of Academics, SUTD Academy, Dr Ong is leading the continuous education and training initiative to help working professionals up-skill or re-skill themselves to stay relevant in the fast evolving job market brought about by breakthroughs in the scientific and engineering world.
As Director of Office of Education, SUTD, he is currently playing a key role in the smart campus initiative, exploring how to take technology-enabled learning to the next level of excellence with state-of-the-art technologies in virtual reality, artificial intelligence and the Internet of Things.

Q: How are you using the tools and technologies you have and teaching them to the staff and students at SUTD? How are you making it relevant and contextual to what the students are learning?

SUTD was set up with a very specific mission, and that's to groom technically grounded leaders and human beings. So technology is always very important, as the name suggests as well. We believe that helping to students build a strong foundation in sciences and mathematics to begin with is key, and when we talk about technology the most part of it is in science and mathematics.

In the age of acceleration where things are moving so fast and with new technologies cropping up, how do we help our students to be future ready? It goes back to the basics/ fundamentals, whichever discipline you talk about.

All our students have to do sciences and mathematics during a common foundational year and in SUTD there's the engineering schools and there's the architecture school. Even the architecture students have to undergo the foundational year of science and mathematics to begin with. So helping them to build a strong foundation so that they can appreciate and understand technology, we think that's very important.

How we're making technology relevant and letting students see they're learning something meaningful and useful? That's done with a better understanding of what the world needs to begin with.

The way we conceive the world is as consisting of key components such as products, systems, services. We look around and understand what the world needs to begin with, then we decide on the curriculum accordingly. It's quite multi-disciplinary in nature, because a lot of times these technical problems or challenges aren't just for Singapore but the whole world, such as climate change or energy efficiency.

The way we structure our school - we don't call them departments we call them pillars - they're multi-disciplinary in nature, and we understand that the world needs to better understand and appreciate how technology can help to overcome a lot of the technical challenges, and other than learning the concepts and theoretical knowledge, we stress a lot on active learning.

So along the way students will have to perhaps build prototypes or involve themselves in project work so they can understand and practise important concepts in relation to technology.

There's a lot of hands-on, collaborative work done. Also not to be overlooked is their humanities, arts and social sciences which play a very important role in our education.

Even though we're SUTD, but we're aware that technology if placed in the wrong hands can have disastrous consequences, so we want our students to make use of technology to make the world a better place, and students have to spend about 22-23% of their time on humanities, arts and social science every year as well.

"Robotics can help us with lesson delivery, it's a matter of how we really incorporate that into our pedagogy. But that said, the value of human teachers won't go away, so technology comes in as a way to enhance teaching and learning, and not to replace the teacher."

Image courtesy of SUTD

That's how we're teaching technology - building a strong foundation in science and maths, understanding what the worlds needs, having a hands-on approach and also an emphasis on humanities arts and social sciences.

Have there been any challenges when it comes to using this multi-disciplinary approach in teaching and using technology?

I think the challenges will always be in getting students to be interested in the sciences, mathematics and technology. The current education system is such that not all students would've done the three sciences offered at Pre-U level (Chemistry/Physics/Biology) so it might be a challenge to those who didn't, but because of our active learning approach there's a lot of interaction between the faculty and students, as well as a lot peer support because we stress a lot on the importance of team work and team spirit.

We know that once the students have graduated they're all likely to be on multi-disciplinary project teams so they need to be able to work with other members who are specialists in their own technical field. So team spirit is embedded in our pedagogy as well, and even in the design of the classroom for example that facilitates a lot of small group discussion.

How different are the classrooms at SUTD different from the ones you might see at the older universities?

I think at the university level a lot of classes are conducted in lecture theatres, and some of the lecture theatres are very big, fitting about 1,000 students. For us because helping the students to build a strong foundation in the sciences and mathematics is so important, many of our classes for the freshmen are conducted in what we call our Cohort Classroom.

It's a relatively big classroom, about 200sqm, fitting about 40-45 students with furniture that's easily reconfigurable so that during the class the students have a lot more interaction with the faculty members and they learn

among themselves as well.
They can even conduct simple experiments in that classroom, so what they're learning is quite timely. Unlike in a conventional setting, when I was an engineering student we'd have lectures, tutorials and then lab classes. For example to cover one topic, it could take about two weeks to do so, from lecture to tutorial to lab.

At SUTD to understand a subject matter, a student could perhaps only need two hours because what happens is the teacher will give the lecture first, then students can have their small group discussion and perhaps some hands-on activities which can help them understand the concepts better. That's all handled within the core classroom, and that helps them to learn in a more efficient manner - instead of it being more of a sequential nature, it's more meshed.

Specifically, can you give some examples of technologies SUTD is using and how it's changing the ways your students are learning?

One of the things was Augmented Reality. For concepts in the sciences or math that are a bit more abstract, AR and Virtual Reality can help students to visualise these concepts better than their mind's eye and not only that but they also get to co-create the AR/VR material so they also learn that process of AR and VR along the way.

We also make use of robotics, where students can use a robot substitute to help them physically attend class if they're somehow unable to do so, and the robot can transmit whatever's happening in class to the student at home. Likewise if we have multiple classes going on and if there's only one teacher, we can utilise the robot to split and share what's going on in one classroom to another classroom.

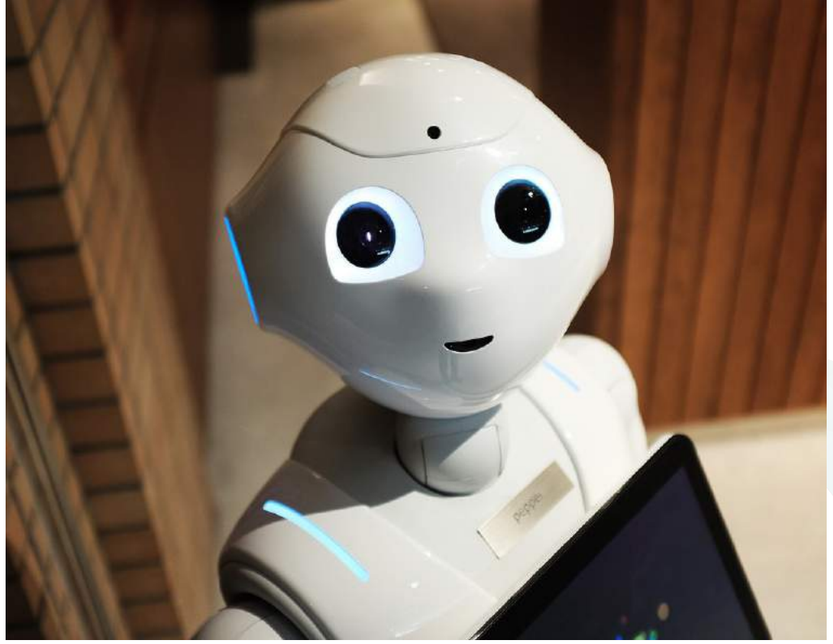
Going forward we'll be looking into an AI-enabled and highly collaborative digital learning platform to allow students to participate in lab sessions over the Internet, so students may not need to go for a physical lab session in order to learn how to programme something or learn how to operate a piece of hardware.

They can learn it through the Internet and to set commands over the Internet to control equipment remotely. On top of that, we want to incorporate an AI engine into it, because it can capture the unique learning behaviours of individuals, and try to come up with studies to help students learn better.

Have there been challenges or any that you foresee?

We're very mindful to try not to make mastering all these technical know-how an end itself. It's to be a means to an end, to help us teach better and for students to learn better. But if one gets too involved then the teachers have to spend a lot of time before they can master it - that could end up becoming a burden or wind up being additional work for the teachers.

There'll be some time needed to help all the stakeholders to see the benefits of the new technologies and on top of that, to convince the relevant stakeholders to invest in technologies. These technologies don't come cheap, but if you look at the ROI it could still be worth the investment, and I believe technology should be able to help us take learning and teaching to the next level.



Does SUTD set aside specific time for the staff to re-train themselves when it comes to learning new technologies?

We have a few avenues for this so we do work with a number of companies when it comes introducing new solutions and technologies such as AR/VR and IoT and we link up our faculty members with these companies. But I wouldn't say we have a fixed framework where we send the faculty for training, we do it in a more spontaneous manner and on a voluntary basis.

How then do you ensure that your staff are well-equipped to teach the technology to your students and maximise the use of it?

Using the example of AR to teach Mathematics, it'll start with the Office of Education introducing this initiative, followed by engaging vendors to collaborate with us to create teaching materials.

We also include students in this process so along the way we co-create something that we make sure is of value, before introducing it to the main classroom. There's a level of quality control there.

Where do you see technology playing a role in helping students become workers of the future workforce?

I think one of it would be the creation of next-gen teaching materials, where there'll be a lot more use of AR and VR. For example a lot of very complex, abstract concepts in Mathematics can now be made into a VR simulation to help students visualise concepts, and that'll help them learn more effectively.

Another way could be - maybe not now - but in the future when AI becomes more advanced, we're looking at robot teachers that can take student questions at any time of the day, so that helps with their learning too, and learning can take place any time and anywhere.

Robotics can help us with lesson delivery, it's a matter of how we really incorporate that into our pedagogy. But that said, the value of human teachers won't go away, so technology comes in as a way to enhance teaching and learning, and not to replace the teacher.

How do you think future learning spaces need to evolve in order to adapt to the new ways of learning and technologies?

One example that we'd like to explore in the future is to incorporate IoT into the learning space; that can capture the dynamics of a class, which will enhance learning analytics significantly. It'll help faculty members to have a lot more data to look into, analyse and see how he/she can make learning more efficient and effective.

For example if you have cameras in the class to capture facial expressions of the students, you can have a real-time understanding of whether the students are with you or losing interest. I think in the era of Big Data and data analytics

we can leverage on sensor technologies to help us collect a lot of useful data which will help to enhance learning analytics.

Also, high bandwidth IT infrastructure will be important. If you talk about allowing students to conduct technical lab sessions over the Internet in a collaborative way and further more incorporate some AI engine into it then the IT infrastructure will need to be upgraded.

What skills do you think the current workforce needs now to prepare themselves for the future?

Areas such as cybersecurity, data analytics, cloud computing - all these are very important technologies that our current working adults need to master to stay relevant in the industry.

But these things are moving so fast - we're in the age of acceleration where the rate of technological advancement is incredible and human adaptability is beginning to lag behind, hence the need for up-skilling and re-skilling.

VOCATIONAL

ROGER LEE

Director

Singapore Institute of Materials Management

*Roger was an entrepreneur involved in the marketing of electronics components in Singapore and ASEAN, and has also managed a Singapore-based multinational electronics company in Silicon Valley, California. He was the adjunct senior teaching fellow at Curtin University of Technology, Perth, for the Logistics and Supply Chain Program, and is also the visiting professor to a few universities in China specializing in logistics and supply chain management. He is heavily involved in technology transfer projects from the USA to Singapore in the high-tech industry and more recently has co-authored 4 books, "*The Making of a Technopreneur", "The Making of a Shell LiveWire Entrepreneur", "World Class Logistics and Supply Chain Management" and "Knowledge Management: Principles and Applications"

Q: How do you teach technology, both to staff and students?

R: For the technology component, it is difficult to "teach technology" as the technology perspectives need the experiences of the students.

The best way is to have practical aspects of technology function, for example: using case studies and also simulation software.

Adaptive learning software is quickly replacing the role of textbooks in the classrooms and students are tackling subjects with the aid of tailor-made computer programs that assist their needs.

How are you using technology in your classroom to enhance learning?

Yes, the pedagogy for training in a technology environment will be different. At the same time, we need to train teachers in learning to teach in a techno environment, however, in a techno environment, the teachers will be trained to act as facilitators so that the students will discover the learning on their own.

There is certain educational software that's used in a number of classrooms, adapts to each student's skill level and lets students learn at a pace best suited to their needs.

To enhance learning in the classroom, we use the e-learning platform with videos. This will ensure that students can revise on their own using the e-learning platform.

We also have e-quiz for the students to participate. Yes, using technology can customise learning for different students who understand knowledge at different times.

The challenges is that technology keep on changing and it is not easy to follow up with the new operating systems of technology. At the same time, how do we ensure strong user experience to ensure effective learning.

How are you using technology in your back office/administration functions?

We are using software which can help us in the student management system for example: releasing of results and doing all the admin for students. We do use similar software packages which we can communicate with students and their parents.

The challenges include the ever-changing landscape of technology.

How do learning spaces need to adapt to new ways of learning and new technologies?

Nowadays, the classrooms are arranged in the different layout, such as: U shape layout to have more interaction with students.

SPECIAL EDUCATION NEEDS

Students do bring their laptops and hence good power plugs and wifi are needed to ensure the learning process. Students must assume more responsibilities in learning to ensure effective learning using technologies.

The future learning organization needs to create great User Experience– this means easy-to-use, available at the point of need, and connected to other resources and people.

At the same time, are we able to ensure group/team learning processes using technology. The most effective learning processes are those that can utilise the power of thoughts of more than one person, and each able to share their thoughts at the same time.

SPECIAL EDUCATION NEEDS

ANTHONY DONOVAN

Additional Educational Needs Coordinator

The British International School Phuket

Anthony specialised in Additional Needs in London where he worked at the Hope Centre for Cognitive Education, following the Feuerstein methodology in mediational learning and dynamic assessment. He also trained as a Dance/Movement therapist at Roehampton Institute London. This has shaped the style of intervention he now employs. He has a specific interest in how social, emotional and motor aspects support learning and has run many workshops internationally on 'cognitive motor work' and 'social thinking skills'. Anthony has interests in a range of sports including tennis, golf and football and he regularly supports these sports in school.

Q: How are you using technology in your role as an educator?

A: There are a number of contexts to this - first it's information storing, gathering and sharing, so things like Google Docs and Google Classroom are part of our information sharing and retrieving process. Keeping information relevant to provide learning support, and that's the administrative end of using technology.

It doesn't sound as exciting but it's absolutely essential to have information that's regularly updated and have live documents so staff know who they're dealing with in class, what their needs are and their targets.

In ways of using technology - the next level is in class, the use of computer information, the use of video capture, voice recording lots of different ways to capture, retrieve and store information because processing speed and memory are two of the biggest issues we have with our students.

So to assist in memory and recording is an essential way of managing things. I also have teachers allowing students to record the lesson, or teachers can do a mini version of the lesson via a recording and the student can watch that, so live video shooting of a lesson and teaching is an important part.

The other thing that we use to support literacy is reading pens, where pens can actually read the text. Dictation systems are also becoming more and more important for students who have either a motor difficulty or problems with coordination, typing or poor handwriting. So dictation systems, notation systems, reading pens are supporting literacy in the classroom, particularly for dyslexic learners is a way we're providing learning support as well.

Ultimately it's about how you're using the technology effectively and creating familiarity and getting teachers to accept and allow it because some teachers can get funny about using technology or recording a full lesson so it's not a full recording but key interventions, instructions and so on.

The new areas of technology which we're more excited about and is growing by the minute are the brain training apps. So things like Luminosity, Elevate, they're growing by the minute and a lot for them do free demos so we'll be trying to unpack those and figure out which works best for us.

A lot of these apps will train your visual perceptual skills, teach students how to develop their working memory, so holding certain parts of information in their head while doing something else and retrieving it later.

The idea that you can train these mental skills using these games is exciting to me because a) students like using their phone and b) they love apps, and these apps are all very beautifully coded and coloured so you can build that as part of a student's intervention package.

On a wider scale, you have companies like Matheletics and Renaissance that are doing an almost complete curriculum of literacy support, so you can use technology and all these games and automatically be assigned your level of capability and if you improve they increase in complexity and if not they go down to your level and start from there.

There's a whole market now of personalised learning systems, it knows you and where you're at, and all this can be done without intervention from the teacher.

This didn't exist before, so the key to all this is practice, and time and effort. If you're able to use these colourful games in their learning, it helps a lot with motivating them to learn.

Were there challenges or potential problems that you foresee with an increased use of these apps and technology-based approaches?

Potentially the disappearance of social interaction skills, where students prefer working with a computer over working with people. Looking at the sheer amount of time they're spending in front of their screens, sitting statically and that affects cognition and dynamic learning.

Over-reliance and over-dependence, lacking expressive communication skills, negotiation and sharing which are fundamental things. So the key is how to keep that balance between social interaction and technology use.

How do you think we can temper this over reliance and promote real world interaction?

Balanced planning, programmes or specific activities for individual work, group work, half and half, so working on a computer to gather and research, but then sharing the information through a presentation. I think that's vital, getting information from the screen and then sharing it in a social setting.

How do you think technology is driving changes in pedagogy?

In different models for learning it's becoming

more and more commonplace, teachers are now looking to see where do we not have technology. For example at some schools all the kids have laptops and part of their curriculum includes taking photographs, videos to capture information.

I think that's become a norm now, and also increasingly teachers are incorporating some element of video in their lessons and showing clips. So it's making lessons more appealing, the only danger is that universities though are still quite behind in their presentation skills.

They're still very much lecture-based where the professor speaks and students take notes. So students come out of school where they had teachers who used all sorts of tools to make learning very interesting, and so they require that level of stimulation. Then they go somewhere else where it's back to books and lectures; it can be a challenge to make that transition.

I know there are some universities who are looking at this but it strikes me from my experience right now that most university lecturers are still very traditional.

Why do you think that is?

I think it's because at the university level the focus is on research. Individual professors or people finding out information and just wanting to share their information, and their findings.

It's a research culture, where students will look at what the research is saying, and everything is just information gathering, there's no real onus to teach and to give that knowledge, it's almost like a suggested knowledge instead.

The model could move towards virtual teaching, where in some ways you don't need teachers anymore, There are lots of online teaching systems right now or even just teaching via things like Skype.

But that's affecting that interface aspect and creating a virtual relationship, and you know virtual relationships can be based on fantasy and not in reality so you get issues such as attachment difficulties.

Children can find it difficult to make a genuine attachment to people and quite often children who are neglected spend a lot of time on computers, and they access things that are inappropriate, outside of their range, they watch film after film after film, and they don't reflect on anything.

Then it becomes pure saturation, another film, another thing. Things like morality and ethical

"(Universities are) still very much lecture-based where the professor speaks and students take notes. So students come out of school where they had teachers who used all sorts of tools to make learning very interesting and they require that level of stimulation. Then they go somewhere else where it's back to books and lectures – it can be a challenge to make that transition."

aspects aren't digested properly so there are some links with violence and some things people no longer realise what's real and what's virtual.

For example you don't play real football anymore, you can play it on FIFA, and you can avoid failing. It's changing a lot and we don't really know where we're headed, but things are cyclical and they keep coming back round, basic fundamentals, getting outdoors, interaction with people, communicating.

With regard to the group of students you work with, those that require intervention, how do you see the role of technology evolving in their lives and helping them to compete with mainstream and even in the future workforce.

I think the key is better diagnostics; better systems to find out how children can function better. Last time it was the style of learning preferences, now it's about finding out the particular issue, is it a processing thing or a language issue or is it audio processing?

What part of the learning area can we identify and with technology how can we best address it? It's a bit like autopilot, planes used to be flown by people - it used to be just teachers and students. But now I can put children on a programme and it can do all sorts of amazing things, it can compare them statistically, with algorithm technology can now predict what grades students will get at Year 11, from Grade 7.

They can tell us what subjects they're likely to excel in, and what they'll achieve. So these data-based questionnaires that find out learning preferences, it works similarly to online shopping that 'if you like this, then you might like that'.

Schools are using this thing called VAR now and it's a character analysis and with this we're finding out more about students' strengths and weaknesses than it being a intuitive thing by teachers.

How much do you set store by technology being able to predict a student's behaviour or grades, when especially for younger children they're still developing?

That's a fair question, but remember we're trying to help children reach the average of that expected norm, and that's what technology can do, children at age 11, what's the expected norm of their performance and technology can take results from performance studies by 11-year olds and compare to see if that's the same for the child. But you're quite right so children can be delayed in their development and if there's a delay, then maybe that's where we need to look at intervention or extra assessment.

That's where the discussion on early intervention comes in, you know there are articles out there discussing whether its a blessing or a curse, and you as a teacher don't want to give children the idea that there's a problem, or they might have a difficulty, and that they're different from others; they're very susceptible to that. It's more of "We're looking at how you're learning, and how we can help with that?"

So I suppose in that sense technology is helping me to investigate better in finding out where students' preferences lie and where they should be performing , because at the end of the day we want our 16-year olds to have a GCSE qualification and without those GCSEs they won't be able to go to the next level.

At the same time parents are also very concerned about results, and there's pressure to achieve as parents want to make sure that the schools fees they're paying are value for money.

But I think the irony as well is the more we do teach, the less they struggle, and the less they struggle, the harder it is for them to achieve, because all learning involves struggle. You can't learn something for someone you have to learn it on their own.

You mentioned parental pressure, have there been challenges when it comes to using technology or has it provided new ways of working with parents?

Parents want data, and want to see what their child is doing at school, but if you think about it once data is created it's out of date. Almost as soon I've tested that day the data might not significant as the student might not have been performing well that day. So I suppose that's the limitation of technology it only knows what you've inputted.

At the same time we're dealing with a lot more anxiety nowadays, a lot more worry and fear of expectations, and because they're not performing, engage in body harming or adverse diets that's affecting their learning as well.

So parents yes we've been able to work with them but they're not always the best customer because they want results. They'll say *'tell me what I need to buy to make my child more successful'* so I am recommending some apps for parents to get and create a habit of practice.

Another thing that works is getting parents is to do the testing of the app or technology itself, that encourages more buy-in.

How do you think learning spaces need to adapt and evolve to meet the new ways of leaning and teaching?

If you're looking at just the classroom, it's always about having a good sound system, good visuals, good ways of communicating to the students, but now we're introducing things like sofas into the classroom.

Areas of relaxation, so students can browse in a more comfortable setting, making the environment more appealing as well, because really it can be quite daunting to walk into the classroom and all the laptops screens come out, so we can rearrange the way the classroom is set up, be it in circles or horseshoes so you can see what's on the students screens.

Learning spaces should include a comfortable spaces to work independently, and also places to facilitate dialogue and discussion.

SPECIAL EDUCATION NEEDS

PRISCILLA LEIGHTON

Learning Support Coordinator

Brent International School Manila

Priscilla Leighton is currently the Student Service Coordinator at Brent. She has spent the past twelve years in California where she completed a Bachelor's Degree in Liberal Studies and a Masters Degree in Special Education from Azusa Pacific University. She also studied Autism at California State Fullerton, earned a California Teachers Credential in Mild-Moderate Disabilities for K-12th grade and has a Cross-Cultural Language and Development Credential

Q: How has your journey with technology been?

P: My journey with technology has been slow. Often schools are behind when it comes to cutting-edge technology because of budget limitations and training. The key is finding free and simple technology that student can use. There is a lot out there, but sometimes it takes an expert to find and apply it. We do use technology to support student needs. I have a wide variety of students and try to selection options that minimize the effect of a student's disability.

My dream is for technology and special education to team up and become the great equaliser in the classroom and in our communities. For this to happen, it must be easy to use and easy to get. I saw several awesome programs today that most children will never access because of funding and awareness.

Along my journey I've also observed often when technology is purchased and placed in the classroom, it is not used to its fullest capacity. This is partly due to the fact that teachers already have so much on their plate. Learning a new gadget or application takes time. Without proper support, teachers tend to set it aside and move on.

It's essential to not only provide the devices and software, but also the tech support and training. Schools need a team of available people helping teaching effectively implement technology.

It's been said "You don't know, what you don't know." That's how I felt at the conferences. Prior to attending I literally did not know what was out there or even what to ask for. Now I'm aware of options and programs to read up on.

Currently in your day to day, how are you using different forms of technology?

On a day to day basis, our students and teachers use all things Google (Classroom, Slides extensions etc). Depending on student needs, we have used assistive technology and computer based intervention programs.

So in the current technology that you use, have you seen it helping your students with learning needs as an equaliser?

In my current experience, I have not been able to see technology function as the equaliser that I hope it to be. Resources and training are barriers in making technology truly equalizer in the classroom.

What are some potential challenges you foresee in the selection and implementation process?

I think the most obvious challenges are cost, access and knowledge. A conference like Edutech Asia addresses the knowledge barrier. Knowing what's out there and selecting the best tech is the first step. I'm often nervous about my own ability to effectively implement technology. Not being naturally tech-savvy, I'm someone who

needs to be explicitly taught. Thankfully, we have a great tech team at my school and our computer teachers are willing to help me. Sometimes I just need to know the right questions to ask!

Taking into account what you've seen and heard about the other experiences, do you think technology is changing pedagogy?

I see a large gap between what technology is capable of and what it is actually doing in the classroom. Majority of the time, tech is used for research and communicating. But, beyond videos to supplement content, it's not dynamically supporting learning.

I would love to see game-based learning take off and other creative ways of learning

"Perhaps all the smart techie people should work on quality, reliable wifi before asking us to implement all the fancy stuff. When that problem is solved, I'll be more open to tech in my classroom."

implemented regularly. Today, I've seen so much fantastic tech for education. But it's just not accessible for the average classroom

You mentioned about technology being an equaliser, and assuming there is more budget and more education, how do you think technology can help your students with learning needs to be on par with/ compete effectively with the mainstream students, and become digital workers of the future?

I think technology can serve as an equalizer when it minimizes the effect a disability has on one's achievement. Tech must be developed specifically to combat a certain weakness. I saw an amazing pair of eyeglasses that connects to a tiny ear speaker. The glasses read whatever they are looking at right into the students ear. I would love a pair of those for my students who struggle with decoding!

I also learned about Boclips today. This program will soon be available for educators and greatly enhance learning for visual learnings through videos. For some students, that's the only way the learn.

I think this has inspired me partner with software developers to create software and devices to assist specific disabilities within the

classroom.

How do you think learning spaces need to evolve in order to keep up with the way learning is changing?

Learning spaces need to be affordable and simple - easy to maintain, install, update - teachers are already time-strapped and a lot of times it's frustrating when they have to learn technology on top of the things they already need to do.

Depending on the reliability and purpose of the technology, many teachers feel like we can already do the job without the technology. Technology should not be another headache- if it's not making life better or easier, then what's the point?

Is technology helping to enhance parent-teacher communication channels at your school?

Theoretically yes, but I find that it also creates a false sense of security. Teachers may think, "I don't need to email, call or schedule a parent meeting because the parents can check the online grading system anytime."

But a lot of parents don't. I've had parents tell me that they hate technology and checking the online system stresses them out, so they won't. Technology can only help if you are willing to use it.

How do you see technology helping your students become ready for the future workforce?

I think game-based learning and video-based learning are ways to enhance their education. Coding is important too.

I can't help but stop our conversation about new and wonderful technology helping our students when to address the reality of infrastructure.

Many schools, in many countries do not get the luxury of fast and reliable internet. It is not uncommon for teachers to have to plan two lessons. One for if the Internet works, and one for it doesn't. Starting a video-based lesson and finding out your speakers happen to be broken is demotivating. Even using an online grading system is frustrating. You can't do your grades if the wifi is slow.

Perhaps all the smart techie people should work on quality, reliable wifi before asking us to implement all the fancy stuff. When that problem is solved, I'll be more open to tech in my classroom.

EARLY CHILDHOOD EDUCATION

EARLY CHILDHOOD EDUCATION

JOAN RADOJKOVICH

Director, Junior Schools

Dulwich College International

JoAn has been a school Principal at Hill Top School, Auckland, Branksome Hall, Jeju Island, S. Korea and most recently at the Canadian International School, Singapore. She has also been the Global Curriculum Manager for the International Baccalaureate Organisation responsible for assembling teams to establish the IB's Foundations Framework. As a school leader she has established a new school from scratch and transformed a school in need into a successful and thriving operation.

Q: How are you using technology at Dulwich?

J: Technology from my point of view is looking at ensuring there's an authentic cohesive vision from the leadership that aligns all our stakeholders; it's quite a complex and demanding process for an organisation with many colleges. How I see it at the moment is we are exploring integrating technology with pedagogy - how pedagogy is driving how we use technology, not the other way around.

In terms of specific skillsets or tools that Dulwich is using, do you have a standard approach as to how you are teaching your staff and students in using technology?

Well, it starts with the leadership of the school or college. We are noticing that the heads of school, the heads of college and leadership in general need to be proactively learning about this alongside the students, teachers and wider community.

Technology is not seen as distinct from what goes on in the school as a whole. We are working together to identity the key areas of where we want to take technology in supporting our student's learning, that's the goal and obviously many things can come into play.

There's values, there's understanding where and how technology plays a role in learning, there's budget, there's country and cultural context; can you access certain programmes, sites, social media or not.

Some of our school have to navigate some of those sensitivities more than others. So the specific skills are no different in terms of acquiring skills for enquiry or competency for any subject area.

The only "standard approach" which resides at the heart of all we do is looking to ensure that the student has as much agency in that decision making when it comes to their learning which includes what technology and when and how to use it.

In my past experience students can be key in driving technology development in schools and in doing so have both identified and provided the professional development for staff and workshops for parents.

They've been the ones to lead the way in innovation, in the design thinking and design approach regarding things they'd like to do and that has influenced teachers to consider the professional development they need and the professional learning that addresses the needs for the students.

So there's professional development for educators to develop their craft and artistry, and ongoing professional learning, which is a little distinct to professional development, to meet the specific learning needs of the students.

By keeping students at the centre of our decision making, student learning and well-being is not a by-product but the central purpose of professional learning. What we're trying to do is identify

"By keeping students at the centre of our decision making, student learning and well-being is not a by-product but the central purpose of professional learning. What we're trying to do is identify the skillsets in terms of technology that we actually need from both a professional development and professional learning point of view that can best help our students with their learning."

the skillsets in terms of technology that we actually need from both a professional development and professional learning point of view that can best help our students with their learning.

I suppose it's like a finding a sweet spot between what teachers want (professional development) and what students need (professional learning)?

Yes, that's a nice description, a sweet spot as you put it.

What other challenges have you faced?

Our responsibility as educators to remember we teach people.

There are so many digital products, ideas, so much exposure to mixed reality - Augmented Reality, Virtual Reality, blended learning, Internet of Things etcetera, that's coming at us at an exponential rate so it's a challenge to consider carefully which product, platform, or programme we engage with that helps to enhance students learning.

This also goes back to my earlier comment which is that pedagogy drives the technology and how we intentionally integrated the two.

In addition, with the pervasive technology that surrounds our students this also highlights the need to be thinking of learning which bring into focus well-being, mindfulness, socialising, outdoor learning in ways we may not have had to consider before.

With regard to the classroom, how are you using technology and how is that changing the way students are learning?

Digital learning is one way of acquiring information, and quickly. Learning to be judicious consumers of this kind of information is crucial. Helping our students understand this and encouraging critical thinking is paramount.

Technology offers our students the potential for greater and wider collaborations with instant scalability to large local and global audiences. Using real time learning, real time feedback, real time collaboration is possible while engaging instant access to others who are interested in learning about similar things.

That's a definite motivation for students as they share their work and can get relatively quick opinions and assessment by others so there's that they receive instant feedback.

On top of that there's real-time feedback using different approaches like See-Saw, which is a platform where parents, teachers and students can share and collaborate on next steps in

learning for our students.

For the particular context I am in, we have the capacity to link across the colleges and this is an area where we want to refine this ability to connect more effectively. The challenge is finding technology that is stable and reliable across different countries, that's something we're still looking to improve.

Are you referring specifically to hardware? Or more towards a social acceptance of the tools that are used?

Both, hardware and functionality that navigates the challenges found in various contexts and across various time zones. We have the social acceptance within our communities. In some of our contexts, servers are blocked in certain countries.

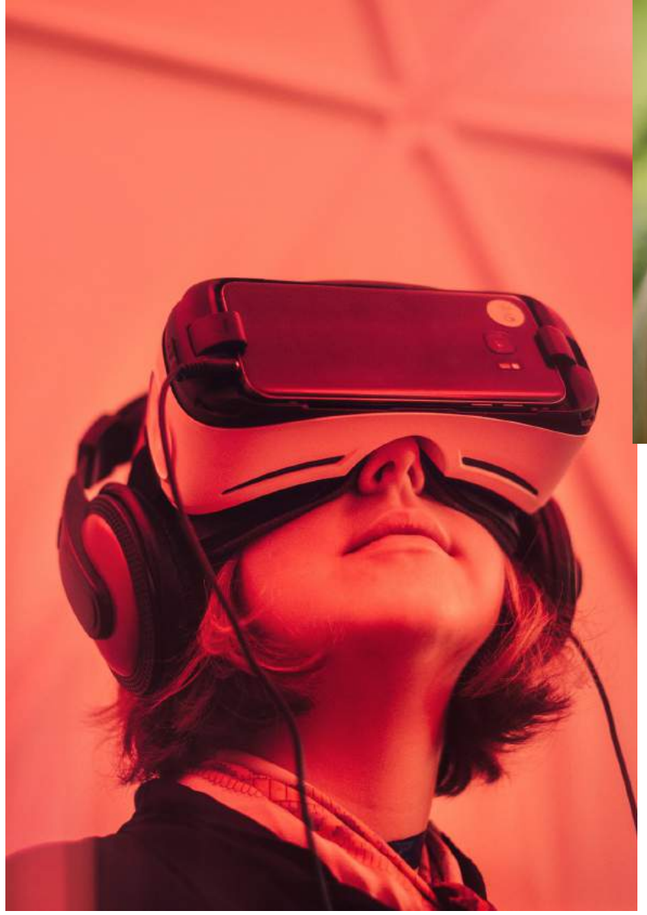
Social media (which can be a powerful professional learning tool such as Twitter) can also be tricky, depending on where you are in the world and that needs to be respected but how do we navigate that?

I think this particular challenge speaks to the issues in creating wider systemic change. At the same time with technology developing at such an exponential pace we have to be judicial in our use of it, not just buy it for the sake of buying it or putting it in the hands of teachers with no expertise or training – that type of action is not going to enhance the outcome of student learning.

On the administrative end of things, how is Dulwich using technology in running the school?

That happens within the individual colleges itself. We also have some platforms to enable across the school collaboration and across college collaboration however at the same time we're always considering ways in which we can become more effective and efficient.

When I look around at everything that's being offered, I can't help but think of how can we make that happen in a more reliable, faster, accessible way.



You've been an educator for a number of years now, so looking back at the last 10 years or so compared to today, how do you see technology changing education?

Well definitely I think when technology was first introduced it was used as tool swapping. For example, a pen (technology in itself) and paper was swapped for an iPad. I think that is an example of technology driving pedagogy - here's an iPad that can help enhance education but in reality it was just a different tool doing the same thing.

But as people became more involved with research and smarter with technology's potential, there was a deliberate shift to get the pedagogy sorted first and then look at the technology that can help transform learning – specifically the acquisition of knowledge and skills and the opportunity to practice, transfer and create something new and novel from new learning and new understandings - including the opportunity to share their work

to specific audiences (local and global) for feedback.

Certainly now for our students using technology to help them understand concepts like the Internet of Things, there is benefit in getting them to come to grips with AR and VR at a very young age. There is no doubt that once you have your pedagogy sorted, you can put a child in a well-considered mixed media environment, and their initial learning - coming to grips with concept and knowledge - can happen faster when compared to listening to an expert or reading a book.

I'm not saying that listening to an expert or reading a book is obsolete, it definitely isn't. However, putting learners in an environment where all their senses are alerted at once can definitely fast-track engagement and productivity.

That could make learning more viable, sustainable, fun - and perhaps for students that require special accommodations, technology could help further in enabling them to gain access to learning, whether it be language or print.

The judicious use of technology to enhance or alter a learner's environment for a specific purpose with mixed media, light, stimulating senses (drones, green screen, cameras, video, mystery skype, twitter links…) can enhance and support learning immensely.

More significant is the transformative aspects of engaging in technology that redefines learning in a way that without technology, that would not be possible.

In addition, we have become aware of the dangers and pitfalls of not thinking well about the implications of technology and it's use in learning.

So, yes, there's been changes in response to how we regard technology in education over the last 10 years and I've no doubt that the next 10 years will bring even greater change.

How about communication with parents? How has technology enhanced the parent-teacher communication channel, and in helping parents understand how technology is being used in schools?

Communication and involving parents in every step is very important. It gives a chance for them to not just be passive recipients but proactive players in enhancing their children's learning so that communication piece is given at the earliest stages and helps the children communicate their learning so parents understand the why of what we're doing inviting them to partner in leading the way as well.

There are tools we can use to make that communication effective, but more importantly it demystifies everything for our parents. They can get access to their children's progress without having to wait for academic records or parent-teacher conferences. I think the demystifying element is really important, ultimately it's a blend of technology and face-to-face interaction, keeping parents close and inviting them in to talk with us, see what we do and also to learn from them.

Schools shouldn't be mysterious places

anymore and I think heads of schools and colleges, rather than be passive implementers of policy, need to lead these conversations in the community where they can really find out and participate in the discourse regarding technology and on other key issues that are in the world today.

Were there any challenges or concerns from parents Dulwich started incorporating more technology use in school?

Parents want to see their children engaged in technology. When you think about it, there's not a public place right now where we don't see a child in a high-chair using an iPad or some other mobile device. I understand that parents are using technology in some form as a survival mechanism, often to calm, appease, regulate their child's behaviour.

So there's a challenge for us to get parents to understand the risk and the importance of what happens when they do that while also respecting their prerogative to do as they see fit.

Parents can also hold misconceptions and misunderstanding around the use of technology in school. In my experience, the more we talk with parents formally and informally about the use of technology, especially for the younger students, the more successful we are in establishing shared values about technology's use in transforming learning.

More recently, there is a developing phenomenon from the social aspect where students don't always understand how to interpret human emotion and interactions - this is a complex by product of confusing what is real from what isn't as a result of existing in the digital realm.

Working with parents in sharing observations and research about this and making recommendations about the type of interaction and frequency of interaction in the digital realm is important.

So, yes, there are challenges. While it's easy to put a device in front of someone because it is expected or it saves time or modifies behaviour it doesn't necessarily enhance learning or teach anything and can be interrupting to social development.

Taking into account what you see as the current and possibly future technology landscape, how do you think learning spaces have to evolve in order to adapt to the new ways of learning and potential new technologies?

There are several learning spaces to consider:
There's the physical learning space, where we're becoming more aware of creating multi-functional spaces for collaboration, knowledge, skill acquisition with time and opportunity to practice these in real contexts.

There is value in considering spaces that don't just have discrete subject spaces so students can draw on different aspects of learning where and when required.

Enabling different tools to be readily accessible as students need them in these spaces rather than moving away to a special part of school to "learn technology" – having tools available in their physical learning space where they can pursue their interests and do something with their learning to contribute in solving real issues – transform learning is desirable.

There is also the internal learning space of the individual – In considering student agency, how do we identify and utilise technology to cater for the individual learner's needs and disposition to maximise and improve the individual student's learning journey?

Lastly there's the virtual learning space - how do we develop that where students have the agency to control, shape, create and redefine the way the learn? As an example, what could it look like for a Year 3 student to choose an area of interest and then determine how to learn, what to create and when to make connections with others regarding their learning not only in school but outside of school in local and global contexts? How could technology support student's learning in this way?

I think we are only limited by our personal and collective beliefs, understanding, and, resolve.

EARLY CHILDHOOD EDUCATION

LAVESA DEVNANI

Deputy Principal, Early Years

Stamford American International School

Lavesa is the deputy principal of Early Years at Stamford American School. In her role she teaches an International Baccalaureate (IBO) curriculum; and integrates the various disciplines in the units of inquiry. She drives usage of a range and balance of teaching strategies, building on what students know, and differentiating; Lavesa works with her team to create differentiated learning experiences to meet the unique educational needs of each student through the various learning centres; and develops trust and effective relationships with children and their parents.

Q: How is technology being used and applied at Stamford?

L: At Stamford, we are working towards the digital goal for all teachers to be Common Sense and Apple Teacher Certified. Our digital learning team supports our teachers through this process. The goal is for all Elementary and Secondary teachers to complete their certification by the end of this academic year.

The next step will be for all Early Years to complete the Apple Teacher Certification. Every teacher has their own way of approaching technology. Since the Early Years philosophy is founded on play based learning and hands approach, we looks at using age-appropriate technology that enhance students learning and experience.

The focus is on the learning objective and not the technology. Technology is used as mean to help students promote critical thinking, problem solving and application of knowledge.

Some examples of technology we use in our classrooms are iPads, Racer Cars, Interactive Promethean boards, Beebots, Recoding Pegs, Wikki Sticks and Virtual Reality Google glasses. Our Early Years teachers document the child's learning journey in a hard copy portfolio while the Elementary students, guided by their teachers, document their own learning via SeeSaw using iPads.

How are you teaching technology?

We have a dedicated digital tech support department who looks after supporting and training teachers with the latest technology, apps, applications and programs.

They collaborate with grade level team and suggest ways they can integrate the various lessons with technology to enhance learning.

In the Early Years it's about using age appropriate tools that can applied in a variety

of settings.

Were there challenges in teaching the staff?

Time is always of the essence. If you're not a very tech-savvy person or find technology intimidating, you may find yourself dedicating a considerable amount of time to learn a new skill.

Software is another challenge that can cause teachers hindrance. You have to constantly learn and relearn new programs and application. There is always something better than what you are currently using. Its a constant learning experience.

Living in the 21st century, we expect all things to be accomplished in time. Physical connectivity like a weak wifi signal or slow connectivity can be a challenge as it slows the momentum of teaching.

Another challenge faced is communicating the purpose and answering the ' why' questions. Why are we using this, why do we have to change? Convincing teachers that it works and implementing small changes continues to be one of our largest roles.

Incorporating technology has been a conscious effort from our leadership team. For example, when I attend leadership meetings we are asked to share a tech tip, and whatever I learn I bring it down to my division and share it with my team. These are simple tips like using certain apps or "hacks" to make our work easier.

Would you say that it's the technology driving pedagogy or pedagogy driving the technology?

At Stamford we are using technology to integrate and enhance learning. The focus is not on the technology, but what the technology can do to enhance learning.

Is technology making genuine personalised learning possible for students?

Technology caters to the different learning

"...if you don't give (students) a channel to try their ideas out they'll never know if their idea can work so in that way I think learning spaces need to provide an opportunity for students to try, and possibly fail"

styles of students. We need find a balance in ensuring that technology is not substituting the fine and motor development of students.

For example, the use of paper and pencil when writing an essay helps develop fine motor skills and penmanship. However, now as you grow older it's all about typewritten essays and homework. But again, the balance may change in the future.

In Early Years, it is less prevalent as we are mindful that children need to develop their fine motor skills or technological skills.

Other than the balance, are there other challenges when it comes to using technology in the classroom?

As mentioned, external factors such as wifi can be a challenge. While we're happy to invest in whatever is needed, sometimes there are factors that are just out of our control.

Expectations is another challenge. How much technology is needed in a classroom? What is the right technology for young students? We have found a balance in incorporating STEAM to complement the lesson while technology is integrated to enhance the lesson.

How is technology being used in the administrative running of the school?

We're a data-driven school, so data is very important to us. Currently we're using Google Classrooms for Secondary students. For communication we use an internal platform

called My Stamford which teachers use to communicate with parents through their weekly blogs. We also use Sharepoint, Microsoft Outlook for email, Google docs and other internal systems for communications.

If you were to look back in the last 10 years - when edtech was introduced it was tool swapping versus now, how do you foresee technology driving systemic changes in pedagogy for the future?

I think teachers will have to start adjusting their pedagogies to incorporate technology. We're preparing students for the future so all we can do is not teach them for jobs that we don't yet know exist, but rather, skills that are needed for the future. Likewise for technology it'll become a lifeskill and if you don't master it, you will be at a loss.

I think it'll be an integral part of everyone's lives starting from a toddler stage and teachers will have to look at how to integrate technology to enhance the pedagogy.

With these new technologies that are coming up and jobs we don't know, how do you think learning spaces need to evolve to adapt to the new ways of learning?

It starts with the teachers keeping up with the times, and always being open to change. Administrators also have to lead the way, and this is why keeping up to date of what new is important.

Our dedicated tech support team conducts research for the whole school and are good at selecting and implementing the technology that's appropriate for the different age groups.

For example, at the moment we have a Maker Space and students that have ideas and want to try something out can schedule a time and experiment with the ideas they have in their head because if you don't give them a channel to try this out they'll never know if their idea can work. I think learning spaces need to provide an opportunity for students to try, and possibly fail.

We also have an Innovation Centre for students - if they have an idea they want to bring to life, they can go there and learn the entire process of creating it with the person in charge. So as educators, our role is to provide learning spaces and an output channel for them to experiment and have free play with their ideas.

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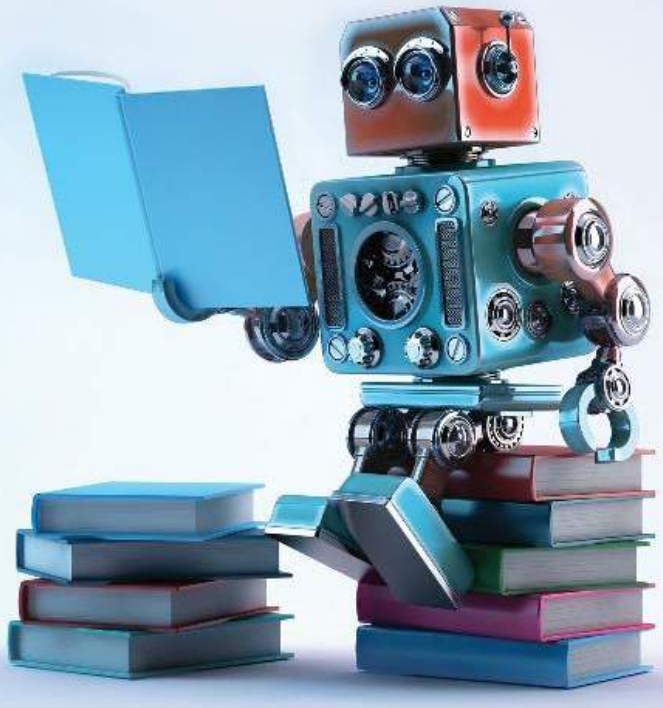

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