

Learning in the Era of Digital Transformation



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It is a pleasure to be back at Wawasan and I'm very grateful to the Acting VC, Prof Zoraini for the kind invitation. My topic today is Learning in An Age of Digital Transformation and I have prepared this presentation with my colleague Dr V Balaji.

Let me introduce my organisation the Commonwealth of Learning. COL is an intergovernmental organisation established by Commonwealth Heads of Government thirty years ago, with headquarters in Metro Vancouver, Canada.

Our mission is to help Commonwealth Member States and institutions to use technologies for expanding access to education and training.

COL believes that learning is the key to sustainable development. Learning must lead to opportunities for economic growth, social inclusion and environmental conservation.

We work in the 53 Member States across the world—from the Caribbean, to Asia, Africa and the Pacific.

COL shares close links with Wawasan Open University. The founding Vice Chancellor Tan Sri Gajaraj Dhanarajan was the President and CEO of COL for nine years, during which time, he laid the solid foundations of what is now, a highly respected organisation.

His successor Dato Tat Meng Wong is an Honorary COL Fellow in recognition for his outstanding contributions to promoting open and distance learning.

I too am proud to be an alumnus of Wawasan, having been conferred an honorary doctorate two years ago

In this presentation, I will first review the context of education today and then look at technology trends in tertiary education. I will then highlight some of the innovations in technology in the last ten years and the more recent developments that are just beginning to emerge. Finally, I will look at the major opportunities that they present and the way forward to transform learning in an age of uncertainty.

First, the context.

In the decade between 2005 to 2015 we have seen a steady rise in Gross Enrolment Ratios in tertiary education from 25% to a global average of over 35 %.

There has been an even faster increase in the GER of tertiary education in East and South East Asia in the decade since 2006. The GER in the region is 43%, substantially higher than the global average. And the demand continues to grow.

Since the 1990s, more women than men complete tertiary education in most countries. According to recent data, there were more female than male graduates in higher education in three-quarters (77%) of the 124 countries surveyed. But despite this, women are less likely to continue to higher levels and research. Globally, women outnumber men at the level of the Bachelor's degree. However, in terms of participation in research and teaching positions in higher education their share is less than that of men.

Higher levels of education usually translate into better employment opportunities and higher earnings. “On average across OECD countries, those with a master’s, doctoral or equivalent degree earn twice as much as those with lower qualifications” (OECD, 2017)

Convinced that higher education leads to higher earnings and social mobility, policy makers have invested in this sector. Both developed and developing countries such as South Korea, Chile and UK have very high GER and the number of people with degrees continues to grow worldwide.

But as Andreas Schleicher concludes ‘countries have skills shortages, not degree shortages’.

In countries as far apart as Japan and Israel, more than 50% employers report having difficulty filling jobs with people with the right skills.

Multiple surveys in 2016 indicated the demand for ‘soft skills’ such as critical thinking, communication, and leadership were what employers were looking for. We have been talking about these 21st century skills for nearly two decades, but to what extent have we integrated these into our curricula? Have we harnessed the potential of new technologies?

Let us now look at technology trends and how they have related to changes in education over the years.

We speak of the fourth industrial revolution today—what has been the impact of these four revolutions on education?

In the first industrial revolution when the steam engine was invented, higher education made a transition from being elite to one which anyone could aspire to. The second industrial revolution was marked by the assembly line and mass production, when it became possible to produce self-instructional booklets and offer correspondence courses. The rise of the computer and internet in the third revolution led to the rise of distance learning and open universities and today in the fourth revolution marked by AI and Robotics, we have OER, MOOCs, micro-credentials.

The recent Horizon report finds that institutions will use analytic technologies in the short term while adaptive learning and Artificial Intelligence will be adopted in the medium term. Mixed reality and robotics will impact education in the long term.

Another important trend that has strong implications for learning, especially in Asia, is the rapid rise of Messaging. WhatsApp and WeChat have billions of users. This is largely because of the increase in the number of smartphones in developing countries. The graph here shows that today there is more traffic due to messaging apps rather than social networks. Because of this, messaging-based learning management platforms will have a faster uptake in the developing world, thereby reducing costs of education and training.

Technology will also have a great impact on the future of jobs and as an Oxford University study found, 47% of today's jobs could be automated in the next 20 years.

Developments in Artificial Intelligence and Robotics will result in changes that we may not be able to imagine today. Automation will have an even bigger impact in developing countries which provide labour.

Contrary to this, the recent McKinsey report (2017) finds that automation will be greater in the developed world. They estimate that about 25% of jobs will be automated in OECD countries; about 10-15% in middle-income countries and the loss of jobs will be severe in the population aged 45 and above. Are we prepared for these eventualities?

This Gartner Hype Cycle shows how technology moves from an initial phase of innovation to inflated expectations which cannot be fulfilled, leading to a phase of disillusionment before maturing and being adopted for mainstream purposes. The rise of MOOCs is a good example of how they moved from an innovation in 2008 to a situation when the international press declared 2012 as the year of the MOOC. Today the dust is settling down and MOOCs are being integrated productively into mainstream higher education institutions.

However, if we review developments over the last ten years, we find that the many innovations driven by technology have not been adopted at the speed and scale at which they emerged. The pace of adoption has been remarkably slow in education. Let us look at some innovations and their implications for tertiary education.

MOOCs with their global reach are disrupting the traditional classroom lecture. Blockchain has the potential to challenge the authority of accreditation bodies. Micro-credentials call into question the relevance of full degrees and OER are disrupting business models built on intellectual property rights.

MOOC platforms allow us to offer free online courses to thousands of students around the world. MOOCs are an important solution to three key challenges in the current education system: one that it is rigid, two, it is highly expensive and three, it takes a lot of time to complete. Top universities have taken the lead in offering MOOCs to a world deprived of quality education at a low cost.

MOOCs are opening up education as never before. Universities have so far largely operated within national or regional jurisdictions. With the MOOC platform, the world becomes a connected classroom.

Blockchain, a major development in the area of financial technology, is, in effect, an open source online register. A learner can have a distinct, persistent ID in this space. An agency that imparts learning can track progress and add scores making the entire set of records a block. It is important to note that the records cannot be modified at all. Many such blocks can be "chained" together. A prospective employer could verify directly the claims about learning achievements.

This diagram created at the Knowledge Media Institute of the Open University, UK shows how different stakeholders including the students participate in maintaining the Blockchain. The student acquires the profile, institutions add credit and status information, accreditors determine qualifications, while the employer can verify the credentials.

Blockchain will challenge paper credentials and paper certificates that are the norm today. Instead of the manual authentication of portfolios, institutions will be able to carry out this process online. The verification can be carried out online and this will make it difficult for digital diploma mills to thrive.

Open Educational Resources or OER are a fairly new dimension of openness. Now there are millions of pages of open content available on the web. How can we benefit from this free quality content?

In the US, the use of open textbooks has resulted in savings of \$2500 per student per year. In Canada, forty institutions in the province of British Columbia have saved over nine million dollars through the use of OER. Traditionally learners have had to bear the high costs of textbooks—in the future where lifelong learning will be the norm, how can we use OER to reduce the costs of skilling and reskilling the learners?

Can these developments in technology help us make our learners more employable? A study of a Coursera MOOC platform published in Harvard Business Review indicates that MOOCs provide many tangible and intangible benefits. For example, 26% found a new job, 9% started their own business, and 62% improved their skills in current job roles.

Let us now review emerging trends in technology which relate mainly to Artificial Intelligence and Virtual Reality. What are the implications for tertiary education? Some examples will suggest future directions.

MOOCs and the interactions of hundreds of thousands of students results in large masses of data. The rise of Big Data is vitally important for the functioning of many services such as banking, airlines etc. In learning Big Data helps us to identify struggling learners even within large groups and to design appropriate remedial measure to help them succeed. The graph here is from a paper published by a group in Harvard and MIT. This group has used data from a MOOC in 2012 that had over a hundred thousand students. They found a correlation between the number of chapters accessed and performance.

Big Data drives Artificial Intelligence, which is a broad set of computing technologies. A more specific set is Machine learning which is a combination of Big Data and algorithms. This is the technology behind self-driving cars. Deep learning is a particular technique of AI to draw complex inferences and is already being used in law, finance etc. As you can see, Big Data is critical for AI-based services.

Let's look at some AI-based services that we're familiar with. We use spam filters in our Email as a matter of course; tagging faces on Facebook is commonplace; the Google translate online service is another example of AI use. Uber can tell us the estimated time of travel with great accuracy and sometimes the personalised suggestions in Amazon seem quite magical.

AI can aggregate millions of news items to produce credible newsfeeds. Reuters, the well-known international wire service, has built and deployed Tracer, an AI service, which can detect news faster than an army of news professionals; it is also good at detecting and explaining unexpected events well before trained news professionals can.

But there is a flip side as well. If used unethically, AI can also be harnessed to generate fake news. Well-meaning popular software can such as Adobe Voco, can mimic a person's voice to utter words that were never said, according to a BBC report. A writer in Forbes magazine, recounts how engineers from Pindrop, an AI company pulled his voice from YouTube and fabricated some comments he had never made and it sounded just like his own voice.

AI is beginning to have a presence in education. An IBM report cites one example of the Intelligent Tutoring System. These systems use AI techniques to simulate one-to-one human tutoring. They are able to provide timely feedback, all without the presence of a human teacher. AI, in particular, Machine Learning, helps to analyse and summarise the discussions in online courses so that a human tutor can guide the students towards fruitful collaboration. AI-enabled systems can group students with similar interests at a similar cognitive level.

A popular example of AI in education is a Virtual Teaching Assistant at the Georgia Institute of Technology. This chatbot named Jill Watson offered personalized assistance to learners in an online course in computer science by using text.

Professor Goyal, who offered the course, analysed data from four offerings of the course. He concluded that in specific domains and topics, it would not be easy for humans to tell the difference between the responses of a chatbot or a human expert.

AI-powered systems can be deployed as robots with human-like speech. According to Anthony Seldon, robots will replace teachers in the next ten years. The role of the teacher will change to become one of an overseer, who monitors the progress of learners, leads non-academic activities and provides pastoral support.

Another example of AI in education is the Intelligent Textbook. Inquire is an iPad App that combines a popular biology textbook with an AI system that answers questions about the content. This was part of a research project at Stanford University.

Assessment has been a challenge for many teachers. According to Professor Rose Luckin at the University College London, “stop and test” assessments do not rigorously evaluate a student’s understanding of a topic. AI-based assessment constantly provides feedback to learners, teachers and parents about how the students learn, the support they need and the progress they are making towards their learning goals.

Augmented Reality and Virtual Reality technologies have great potential to improve learner experience. VR can immerse the learner in a simulated experience while AR can alter one’s current perception of the real-world environment through visuals or sound. Both AR and VR have a major presence in the mobile world. The leadership in these technologies is entirely with commercial systems and costs continue to be high. Some institutions have established labs for students to experience AR/VR. However, these are so far available in well resourced urban centres—what about learners in remote rural areas?

Another concern is how far these devices contribute to learning. A recent report from the House of Lords UK draws our attention to the potential negative impact of AI on society, culture and the economy. If AI services are built with an initial bias, such as an ethnic bias, this can pervade the system with dangerous consequences. Such a bias can undermine educational efforts if not noticed and corrected at the design stage.

In addition to education, the most critical impact of AI is on “work” itself. Nearly every expert estimates that the nature of work would be drastically transformed. Whole professions could disappear. Jobs that do not yet exist might become mainstream in a short time. Middle-level jobs may disappear while we may see a marginal increase in highly skilled jobs. How does the education sector prepare for this?

In this scenario, learners will need to skill and reskill themselves. Learners will need to move back and forth from academia to employment. This will give rise to the network of multi-versities. Micro-qualifications will be as important as degrees. The faculty will also have to become lifelong learners to keep pace with these changes. The focus will be on acquiring knowledge and skills in new modes of delivery and pedagogy.

Within these uncertainties how can we equip learners to deal with the future? Three essential literacies have been proposed by Robert Aoun. First, the human literacy, prepares students to perform jobs that only human beings can do. Human literacy will help them to make ethical choices, equip them for social engagement through effective communication. All learners must have adequate exposure to humanities

and liberal arts. Data literacy is essential in a world driven by data. Learners must be able to find meaning in the flood of information around us. Technological literacy is essential if we are to understand machines and their uses. Learners must be able to deploy software and hardware in order to maximize their powers to achieve and create.

Finally let us look ahead and re-imagine learning in the era of digital transformation. Learning presupposes the learner. Who is this learner?

In the 1980s, the ‘new learner’ was the adult who looked for education and training for personal development, promotion, change in career, and/or enhanced job requirements.

The turn of the century gave rise to the digital natives who are technology-savvy learners, usually young school-leavers entering the higher education system.

Today, the learner in higher education is one who has the technological means to learn, is motivated, self-regulated with analytical and collaborative abilities to perform well.

What will the learner be in 2035? A typical learner may be using MindClock to remind her of upcoming events, use help from a Holographic Advisor Bot for critical thinking and design to plan for an assignment, use advanced communication tools to learn from multiple language materials on the Internet, take several micro-classes simultaneously, learn from home without attending physical lectures using tools that provide a virtual experience of real time events, and use teaching bots to prepare for assessments and exams. All activities will involve using technologies of the future. Some of these are still not invented. (Contact North, Insight paper, 2017)

The global community adopted the 17 SDGs of which SDG 4 is dedicated to education and aspires to ensure ‘inclusive and equitable quality education and lifelong learning for all’ The higher education community cannot remain aloof from national and global goals.

In short we need to prepare an ecosystem that promotes lifelong learning for all. Higher education systems need to embrace lifelong learning and strengthen their outreach function to open up education to wider constituencies especially the unreached. Lifelong learning includes the whole spectrum of formal non-formal and informal learning. Simply reforming current education systems will not be enough. Countries will need to continually skill and reskill their workforce throughout their life

Changing 4 jobs by 32 is the new normal for the millennials. Thus, it would be imperative to prepare them to be employable. This will require a balance between theory and practice; a focus on hard as well as soft skills, a curriculum that addresses the needs of industry and society. The orientation will change to providing certification based on competence rather than the number of hours attended.

To create an education system that is responsive to the market needs and future requirements, it is necessary to look at the different stages of the employability pathway and re-imagine our policies and practices.

Let us conclude with the three E’s required to re-imagine learning in this age of uncertainty. As robots take up cognitive tasks which they can perform much better than human beings, what human being can bring to the table is empathy—how can we teach these skills to our learners? The costs and location of the emerging technologies in global centres disadvantages people in remote areas—what policies and practices do we need to put in place to ensure that we don’t widen the existing digital divide? Finally, there is the question of ethics—will these technologies be like the monster Frankenstein or will they bring peace and harmony in the world? The answer will depend upon our decisions.

Thank you for your attention.