Innovations in Higher Education: Re-Imagining Learning

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It is good to be back in Port of Spain and I thank Dr Linda Steele, Mrs Claire Craig and the ACHEA Organising Committee for the invitation. My topic today is 'Innovations in HE: reimagining learning" and I have prepared this presentation with my colleague Prof Romeela Mohee.

As you know, COL is an intergovernmental organisation established by Commonwealth Heads of Government thirty years ago, with headquarters in Metro Vancouver, Canada and a regional office for Asia in New Delhi.

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. This can be done by effectively harnessing the potential of existing and new technologies.

In my presentation, I will first review the context of higher education today and then look at some innovations. I will then highlight some of the innovations in technology over the last decade and look at the emerging trends and the implications they have for higher education policy and practice. In conclusion, I will look at some concrete ways in which we can re-imagine learning for a more effective and innovative teaching and learning experience.

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 a gradual increase in the GER of tertiary education in the Caribbean small states during this period to 22%, which is well below the global average. However, this may be an understatement because of lack of available data.

For example, based on available data in 2004, it would seem that the GER in tertiary education stands at 11.5%. However, the Statistical Digest issued by the MSTTE in 2010 estimates that the Gross Enrolment

Ratio of the post-secondary and tertiary education sector in Trinidad and Tobago for 2009-2010 was at least 46.9%. Could this increase be because of GATE?

Since the 1990s, more women than men complete tertiary education in most countries. According to recent data, there were more female than male graduates from higher education in three-quarters (77%) of the 124 countries surveyed. Globally, women outnumber men at the level of the Bachelor's degree (ISCED 6, first degree), with men accounting for about 47% of graduates and women accounting for 53% in countries with available data. However, in terms of participation in research and teaching positions in higher education their share is less than men.

Higher levels of education usually translate into better employment opportunities and higher earnings. "Among tertiary-educated adults, the relative earning advantages increase with the level of tertiary education. 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)

Similarly, if we look at data relating to tertiary graduates in Canada, we find that the earnings of a PhD is almost double that of a college graduate.

Convinced that higher education leads to higher earnings and social mobility, policy makers have invested significantly in higher education. Both developed and developing countries such as South Korea, Chile and UK have very high GER and the number of people with degrees grows 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 since the turn of the century, but to what extent have we integrated these into our curricula? Have we harnessed the potential of new technologies?

Let us now turn to what we mean by innovations in higher education and how they relate to changes in education.

What innovation do we see in a typical classroom at most college and universities today? Are these spaces and transactions going to change and what will drive those changes?

If we review developments over the last fifty 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 adopting innovation in higher education has been relatively insignificant.

We have seen that innovations emerge when mainstream provision fails to cater to the changing needs of a learning society. These are supported by developments in technology and give rise to a new breed of providers.

We speak of the fourth industrial revolution today—what has been the impact of these revolutions on innovations in 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 open and distance learning and open universities and today in the fourth revolution marked by AI and Robotics, we have OER and MOOCs.

Developments in technology will continue to drive changes in the way we teach and learn. The 2018 Horizon report finds that adaptive and mobile learning will impact higher education in the short term while next generation LMS and Artificial Intelligence will be adopted in the medium and longer terms. The trends emerging from technology adoption will result in blended learning and collaborative learning. In the mid-term, there will be a growing focus on measuring learning and re-designing learning spaces. In the longer-term, the focus will be on innovation and deep learning.

Another important trend that has strong implications for learning is the rapid rise of Messaging. WhatsApp and Messenger have billions of users. Global traffic due to messaging apps is larger today than social network apps. This is largely because of the increase in the number of smartphone users everywhere including in developing countries. The graph here shows that by the middle of 2015, Apps that worked only with Messaging platforms had more users than Apps that worked with social network platforms. Because Messaging is much more widely used, Messaging-based learning management platforms will have a faster uptake in the developing world, thereby reducing costs.

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.

It is clear that 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 preparing our students for this uncertain future?

This Gartner Hype Cycle shows how technology moves from an initial phase of innovation to inflated expectations which cannot be fulfilled and this then leads to a phase of disillusionment before maturing and being adopted for mainstream purposes. The rise of MOOC 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 some mainstream higher education institutions.

Let us look briefly at the last decade of digital transformation.

MOOCs with their flipped classroom and global reach are disrupting the 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 allows 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. Students had limited interactions in the classroom or on campus. Today, there is a greater emphasis on

peer to peer interactions and the use of social media. Universities will increasingly make use of emerging technologies to support their learners, the digital natives.

Blockchain, a major development in the area of financial technology, is, in effect, an open source online register that is maintained cooperatively. A learner can have a distinct, persistent ID in this space. An agency that imparts learning could track progress and add scores and sign off making the entire set of records a block. Another agency where the same learner takes up learning can create a similar block. It is important to note that the records cannot be modified at all. Many such blocks can be "chained" together.

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. The verification process will be possible online and this would deal a blow to digital diploma mills. Instead of the manual authentication of portfolios, institutions will be able to carry out this process online.

Because of the near ubiquity of technologies, it is now possible to offer micro-credentials. As we seek to skill and reskill our learners for the changing nature of jobs, micro-credentials provide options for low-cost flexible learning. MIT has already introduced the MicroMasters programme which can prepare the learner for employment or further qualifications.

Micro-credentials will make us re-think our semester courses to develop shorter modules, which can be taken at one's own pace or time. The credentials can also be transferred from one institution to another.

Open Educational Resources are educational materials which are free and freely available, are suitable not just for higher education but for all levels including primary and secondary education. OER can be reused and repurposed to suit different needs and could be available in any medium, print, audio, video, digital. One key difference between OER and other educational resources is that OER have an open license, which allows adaptation and reuse without having to request the copyright holder.

The rise of OER signals three shifts for institutions. Traditionally learners have had to bear the high costs of textbooks—the future could mean free content for all. There are course development teams within the university responsible for creating content. Now the teams will be dispersed around the globe and will adopt/adapt existing OER. The rise of OER will encourage the student to be a producer rather than simply the consumer of content.

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 to the learners. 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 higher education?

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 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, the use of robots will change the role of teachers in the next ten years. The teacher will become 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.

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 technological means to learn, often 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 the 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. The orientation will change to providing certification based on competence rather than the number of hours attended.

To create a higher 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. How can we train our learners to be innovators?

In their book *The Innovators' DNA*, Dyer, Gregerson and Christensen identify innovation skills that can be learned: questioning, observing, networking and experimenting. Leaders can ensure that they create a culture where these skills can be acquired and reinforced.

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.