Preparing for a Different Future – Learning in an Age of Disruption

Preparándose para un futuro diferente - Aprendiendo en una Era de Disrupción

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Abstract

Global change dynamics require a refocusing of educational policy and practice so that there is a relentless commitment to building a sustainable society and circular economy focused on equity. This paper explores several dynamics of global change and the implications of these dynamics for education, especially education beyond school. It will look at the range of response to these challenges and how they contribute to improving access and success in education. Specific developments in higher education occurring around the world which suggest patterns of change for the future. These developments are placed in the context of both the ongoing war for talent and the competition between public and private interests in education.

Keywords: technological change, new forms of learning, technology uses, emerging agenda.

Resumen

La dinámica del cambio global requiere una reorientación de las políticas y las prácticas educativas para que exista un compromiso incesante de construir una sociedad sustentable y una economía circular centrada en la equidad. Este artículo explora varias dinámicas de cambio global y las implicancias de estas dinámicas para la educación, especialmente la educación más allá de la escuela. Se verá en el rango de respuestas a estos desafíos y cómo contribuyen a mejorar el acceso y el éxito en la educación. Se presentan desarrollos específicos en la educación superior que ocurren en todo el mundo, los cuales sugieren patrones de cambio para el futuro. Estos desarrollos se ubican en el contexto de tanto la guerra por el talento en curso como la competencia entre los intereses públicos y privados en la educación.

Palabras Clave: cambio tecnológico, nuevas formas de aprendizaje, usos de la tecnología, agendas emergentes

A number of change forces are reshaping communities, organizations, work and identity. These global forces require educational organizations to rethink their purpose, ways of working and their collaborations so as to better serve the needs of society. They are leading to new kinds of educational organizations, new forms of learning and new kinds of credentials as well as a relentless focus on skills development.

These global change forces are:

● **Demographic Shifts** – In the Republic of Paraguay, the population is growing at a steady rate of 1.23% per year. By 2050 an additional 2 million people will live in Paraguay, taking the population to app. 8.9 million persons. By 2050 this older population will be almost equal with the younger population as the birth rate continues to fall (World Bank, 2017). In other countries around the world – Canada, US, Japan, Russia and parts of Europe – an ageing population is reshaping the workforce, communities and the economy. Several countries have

dependency ratios (the number of people not in work compared to the number of people in work) that are falling rapidly, with Japan already at 1:1 (Bricker and Ibbitson, 2019). Paraguay's dependency ratio has been falling since 1960.

● **Shifts in Regional Economic Geography** – By 2050 the shape of the global economy will shift from the "old" Europe and North America to Asia, especially China, India and Indonesia. 424 cities will generate 75% of the world's GDP and 325 of these will be in Asia (UN DESA 2018). It is already the case that 50% of the world's largest companies are headquartered in Asia.

● **Climate Change, Population Growth and Sustainable Development** – By 2050 there will be between 9.7 and 10 billion people living on earth (United Nations DESA, 2015) and climate change will spur significant changes to where and how people live (IPCC, 2018). Water and extreme weather events in particular will shape politics and the global economy (Ward, 2003; Platt, 2012).

● **Technological Disruption** – Emerging technologies, especially artificial intelligence (AI), 3D printing, robotics, genomics and new material technologies, will reshape many industries from financial services, retail and transportation to construction and education (Frey and Osborne, 2013). Some estimates suggest that some 30-40% of all current work activity will require change, given the power of these technologies (Bakshi, et.al, 2017).

● **New Models of Organizations** – Coupled with all of the developments is the rapid emergence of new forms of organization: flatter, nimble organizations that leverage a global workforce (Lynes, 2017). Uber is one example, but there are many more which use the same principle of technology enabled workforce management to deliver goods and services (Tapscott, et.al, 2000). These organizations rely on intangible assets to generate wealth (Haskell and Westlake, 2017).

● **New Models of Work** – The so-called "gig" economy of freelance work is becoming a dominant model in some economies (Prassl, 2018). In Paraguay, some 30% of workers are self-employed, which is lower than the rates for Peru (35%), Dominican Republic (37%), Bolivia (40%) and Colombia (42%) (Siseles, et al, 2018). Self-employment is the fastest growing form of employment in most economies of the world.

● **New Challenges for Economic Development** – Debt, Austerity and Recession. Global debt from governments, corporations and individuals is currently (app.) US$240 trillion - US$100 trillion higher than the level of debt before the 2007 financial crisis (Blatchford, 2019). Unfunded pension liabilities of governments will constitute an additional US$400 trillion of debt by 2050 (Shedlock, 2018). As one commentator has said, "we no longer speak of business cycles we speak of debt cycles". Within these debts is significant consumer debt, now ten times higher than 45 years ago (Schiappapietra, 2018). All of these debts suggest a coming, major recession (Mauldin, 2018).

● **Growing Social and Economic Inequality** – a characteristics of our time is growing social and economic inequality (Piketty, 2014). Globally in 2018, 26 people owned the same amount of wealth as the 3.8 billion people who make up the poorest half of humanity (Oxfam, 2019). In some countries, the poorest 10% are paying a higher portion of their income in taxes as the richest 10%. In Paraguay, the GINI coefficient, which indicates economic inequality, has dropped from 0.5124 to 0.4714, there's still a significant gap between rich

and poor Paraguayans. According to the General Statistics Surveys and Census Bureau (DGEEC), the poorest 40% of Paraguayans receive only 12.5% of the nation's revenues, while the richest 10% secure 37.1% of all income. In part this reflects patterns of employment – less than 6% are employed fulltime – and in part the decline of rural communities (Lopez, 2017).

● **The Sense of "Self" and Identity** – a further characteristic of our time, fueled in part by social media and a culture of "self" before others but also by several of the significant shifts described above, are issues related to meaning, purpose and identity (Harari, 2015, 2016, 2018). Social changes in the structure of families, new patterns of work and employment, the growth of social networks as defining features of identity as well as the challenges of daily living are leading to life-style changes for the iGen and millennials (Twenge, 2017) and to increased levels of anxiety, stress and mental disorder. Some of these developments are captured in global mental health statistics (Ritchie and Roser, 2018). In Canada, by the age of 40 half of all Canadians will have experienced a mental illness, with those aged 15-24 the most vulnerable (Canadian Mental Health Association, 2018). In Paraguay, anxiety and depression are significant causes of disability and interpersonal violence is a significant cause of death – significantly higher than the world average (IHME, 2018).

There are other global forces at work, including accelerated globalization (Stiglitz, 2017), the growth of nationalism and populism (Eatwell and Goodwin, 2018), the emergence of new forms of intangible capital (Haskel and Westlake, 2018) and domestic terrorism (Levin, 2006), but these developments are sub-sets of those described here. The point is clear: the future is not a straight line from the past.

A Different Future and the Renewal of The Purpose of Education

Gert Biesta, a leading philosopher of education, reminds us that education is a "beautiful risk". It requires us to find meaning and purpose through learning for each child in school, for each person in college or university while at the same time equipping them with the knowledge, skills and capabilities required for active citizenship, meaningful work and the pursuit of a meaningful life (Biesta, 2014). Yet this broad liberal agenda, which can be traced back to John Dewey (1916), has been subject to challenge by a neo-liberal agenda with a much narrower focus on competencies as measured by standardized test results and simple measures of value-add and market performance (Labaree, 2011;Sellar, et.al., 2017; Sahlberg, et.al., 2017). There is a tension between a market driven, neo-liberal global education reform movement (GERM) and educational policies driven by equity and a respect for the profession of teaching (Murgatroyd and Sahlberg, 2016). What policy makers seem to be seeking is educational achievement with integrity (Shirley, 2017) informed by a deeper understanding of the role of technology, if any, in shaping educational outcomes.

But policy makers are also concerned about costs and return on investment. As a people intensive activity, educational costs rise as the costs of labour and capital rise. In Canada, expenditures on elementary and secondary education have risen 17.3% (adjusted for inflation) in a decade and now stand at $65 billion (Fraser Institute, 2019). Canada's colleges and universities have experienced significant reductions in Government funding – a cut of almost 50% (Royal Bank of Canada, 2018) – with the result that students pay more for tuition and contribute a higher portion of college and university revenues than in many other countries, leading Canada to have one of the most privatized systems of higher education within the OECD (Ivanova, 2012). So as to compensate, universities and colleges hotly pursue foreign students who pay a higher level of tuition.

Cost growth becomes a political issue, especially given the levels of indebtedness of governments around the world. In a world of cost-constraints and austerity, controlling cost growth and preferably reducing costs or transferring costs from public finances to others has become an attractive and often favoured policy option.

Neo-Liberalism and the Pursuit of Capital Gains

Education is a contested space. Part of the contest is political – ideological driven based on differing views of the place of government in education (Hargreaves and Shirley, 2009). Encouraged by the World Bank (World Bank, 2018a) and others, many governments seek to reduce the growth of educational costs and to improve educational performance through market mechanisms (Turner and Yolcu, 2016), despite the lack of evidence of the efficacy of this strategy (Ravitch, 2013). Other governments, such as those in Finland and Norway, see education as a public good which should be funded by the public purse (Sahlberg, 2015).

Nowhere better has this tension between public good and private capital been demonstrated than in the United States, where many States have turned to the private sector and financial transfers through school vouchers so as to "improve performance" and "enable innovation", while respecting "parent choice" in the school system. Indeed, the current US Secretary of State for Education, Betsy de Vos, has said public education is "a closed system, a closed industry, a closed market. It's a monopoly, a dead end" (Strauss, 2016). Charter schools and vouchers have not produced the outcomes hoped for. On simple measures, such as those offered by the 2015 OECD Program of International Student Assessment (PISA), the United States ranks 24th in reading, 25th in science and 40th in mathematics – lower that it was in 2012 (OECD, 2016). The OECD has made clear that market mechanisms do not lead to better outcomes:

> "School choice advocates often argue that the introduction of market mechanisms in education allows equal access to high quality schooling for all…However evidence does not support these perceptions, as choice and associated market mechanisms can enhance segregation." – OECD (2012)

a view reaffirmed by the World Bank (2017, 2018a). Further, there is strong evidence that charter schools cost more and produce less than public schools (Burris and Bryant, 2019).

Another component of the contested space relates to money – who will secure access to the significant expenditures on education in schools, colleges and universities? Ideology and money are clearly linked. Neo-liberal thinking encourages competition between public and private providers of education, the substitution of public provision by private provision and loosening of regulations so as permit the growth of markets for students (Giddens, 1999; Abrams, 2016). The prize is large – the global education market for schools, colleges and universities is set to be worth US$10 trillion by 2030 (Holon IQ, 2018). At risk is the delicate balance between the purpose of education and economic-unitarianism.

To capture some of the financial prize, major commercial entities have positioned themselves as learning providers and enablers of educational provision and policy. Amongst these are Pearson Corporation, the world's largest publisher, which repurposed significant assets to capture the emerging market for digital assessment, digital learning resources and the resources needed for skills and competency development (Wan, 2018). A component of Pearson's strategy has been to partner with global organizations which are setting the agenda for education, such as the OECD which partners with Pearson to offer education system evalua-

tion services for governments, such as the Program for International Student Assessment (PISA).

Most recently the OECD has been moving to position itself as the primary agency responsible for tracking progress on the UN's Sustainable Development Goals (SDGs) and the updated OECD Learning Framework 2030 (OECD, 2018) extends beyond the cognitive economic focus of 'education quality' (reading, math and science) to encompass the non-cognitive dimensions highlighted in SDG 4.7:

". . .the knowledge and skills needed to promote sustainable development, including, among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development." (Target 4.7, United Nations Educational, Scientific and Cultural Organization (UNESCO), 2016: 20)

The measure of global competency, developed as part of this non-cognitive domain, was originally developed by Pearson in partnership with the OECD (Auld and Morris, 2019).

A second example of commercialization is the growth and development of online program managers (OPMs) which help colleges and universities become significant online players. These organizations, such U2 and Hot-Chalk, design, develop, market, deploy and deliver online program for universities and colleges not yet fully engaged in online learning. Arizona State University (ASU), for example, has become a major online learning provider due entirely to the work of their OPM partner: Pearson Corporation. From a standing start in 2010, ASU now has some 30,000 students enrolled in more than 150 undergraduate and graduate degree programs offered online. OPMs are set to become a global US$8 billion sector by 2020.

A third example of the attempt to capture educational revenues relates to the providers of Massive Open Online Courses (MOOCs). In 2018 some 101 million individuals signed up for a MOOC from one of nine hundred universities and colleges providing them (Class Central, 2018) . While some providers are non-profit organizations (in the US edX or SWAYAM in India, for example), others are for profit entities seeking to secure a revenue-driven market, which now includes MOOCs for degrees and micro-credentials (e.g. Udacity, Coursera, XuetangX, and FutureLearn). They are successful and, in several cases, profitable. The University Grants Committee in India now permits the use of MOOC based learning to count for up to 20% of a first degree at anyone of its eight hundred accredited Universities. In Malaysia, MOOCs are also part of the process of securing a first degree in public universities (Shahar, 2016). Currently, there are forty-five full degrees available through MOOCs in the English-speaking world (Class Central, 2018).

These political and commercial interests come together at the system level when the focus is on the skills agenda being pursued by governments around the world, most especially the preoccupation with science, technology, engineering and mathematics (STEM). Governments around the world have bought into a purely commercial proposition that the future economies of the world depend on STEM and that STEM skills are pre-requisites for professional work in the future. This despite the fact that half of STEM graduates do not work in STEM professions or organizations (US Census Bureau, 2014) and that 40% of those that do work in the STEM sectors do not have degrees or related STEM qualifications. Further STEM employers are seeking a broader range of skills – design thinking, teamwork, critical thinking, creativity, problem finding and solving, Imagineering – than the narrow band of skills "packaged" in many STEM programs (World Economic Forum, 2016). The packaging and marketing of STEM as a policy imperative is one of the most successful examples of the take-over of public policy by commercial interests.

The emerging frontier for capitalism and neo-liberal thinking in education relates to technology, most especially artificial intelligence, augmented and virtual reality (AR/VR) and robotics. The vendor view of the education sector is that it is "grossly under-digitized", with less than 3% (US$142 billion) of the US$6 trillion current expenditure spent on digital technology. Forecasters suggested that this could grow to US$342 billion by 2025 (Holon IQ, 2018), driven largely by growing sales of artificial intelligence, augmented and virtual reality systems and the rapid growth of online learning, especially in Asian markets. The idea is that adaptive learning technologies will enable learning to be "personalized" and that AR and VR will transform the experience of learning, permitting immersive experiences. There are some who also think that robots can supplement or replace teachers (Bodkin, 2017; Seldon with Abidoye, 2018).

Key Developments at the Frontier of Change in Higher Education

Given this broad context of a contest for education between public and private interests and the growing demand for skills for a society and workplace in transition, what are the patterns and trends which are emerging which will shape education in the future? What can be seen from amongst the myriad of developments which point to a different future?

The focus in what follows is on higher education and the patterns and changes which can be seen which reflect potentially significant tipping points for the design, development and deployment of learning opportunities. Informed by a global shortage of skilled and professional labour (IBM,2016; OECD, 2018) and the challenges of global financial conditions, which especially affect government, innovations in education are being sought which will both increase access and success in learning for a greater range of learners.

More specifically, the policy of many governments is focused on creating learning opportunities for those traditionally denied access to universities, colleges and training. While MOOCs and online learning have been part of this response, it is not yet clear that those accessing these learning opportunities have a significantly different profile from those who have traditionally accessed education beyond school (Ho, et.al, 2015).

A 2018 study suggests that the expansion of higher education, which began in earnest in the 1960's, will continue, with some 600 million students enrolled in universities around the world by 2040 with parallel growth in colleges, apprenticeship and training organizations (Calderon, 2018). This growth will be especially strong in India, Africa, China and the Middle East.

In a substantial overview of developments in higher education in the developing world by the International Bank for Reconstruction and Development / The World Bank (2000) the authors note that there has been such a massive expansion of higher education in developing nations that the system has moved from a system geared to elites to a system focused much more on access for suitably qualified candidates, no matter what their background.

Some specific examples of the developments intended to increase access and reduce barriers to success have occurred through:

● **The development of mega universities** – there are institutions in India, Iran, Turkey, Pakistan and Bangladesh each with over a million enrolled students. The largest is the Indira Gandhi National Open University, based in Delhi with over 4 million enrolled students. There are at least sixty-five degree granting entities with over 100,000 students enrolled.

● **The development of open universities** – where admission is open to all, but completion is based on performance. Well known examples include The Open University (UK), Athabasca University (Canada) and Sukhothai Thammathirat Open University (Thailand).

These universities do not require prior learning achievements (certificates, high school completion, etc.) for admission to their undergraduate or first level programs. There are now sixty-five open universities around the world, with two in South America (Argentina and Venezuela).

● **The growth of differentiation within higher education** – more and more institutions are seeking to differentiate themselves from their sister institutions within and between jurisdiction, focusing on specific areas of study. For example, the recently created Ocean University of Sri Lanka focuses on maritime and sea transport logistics, while the Institute for International Law in Abu Dhabi does what its name implies. There are a great many technical and Polytechnic institutions as well as Schools of Design, Art and other discipline focused institutions. There are also institutions exclusively for women, indigenous peoples and minorities. Specialized institutions are now a key part of the fabric of higher education around the world.

● **The development of private provision** – a fast growing private sector in many (but not all) nations is adding both to the capacity and nimbleness of higher education provision and also to its complexity. Not all of these private developments are for profit, there are also significant non-profit and philanthropic institutions, such as Amity University in India. Some 80% of higher education students in the Philippines are enrolled in private institutions and they play a major role in Korea, Japan, Belgium, Indonesia, Columbia, US, India and Brazil.

● **The growth of dual mode universities** – universities which offer both on campus and online / distance learning programs are also contributing to increased access. Major dual mode universities include University of Laval (Quebec), Deakin and Murdoch Universities (Australia) and University of Madras (Chennai, India).

● **The emergence of open education resources (OER) for credit** – more recently, students have been able to study through the use of open education resources (free to use learning materials), be assessed and obtain transferable credit which can then be used in many on campus or online programs around the world. The OERu (Mackintosh, 2017) seeks to provide exactly this service.

All of these developments have aimed to make affordable access to suitably qualified or motivated candidates possible and each of these developments have contributed to massively increased access to higher education.

One group that has especially benefited from these developments has been women. The World Atlas of Gender Equality in Education, published by UNESCO (2012), suggests that, in the last four decades, a significant reversion of the historical process of exclusion of women in higher education has occurred and women have gained significantly more access and success at this level of education. These are, however, two regions where this is not the case: South and West Asia and in sub-Saharan Africa. Women are still under-represented in some disciplines in some regions and have a long way to go to ensure pay equity following qualification, even in developed nations (World Bank, 2018b).

More recent developments are also intended to both increase access to and success in education beyond school and to accelerate the completion of qualifications which recognize knowledge, skills and capabilities. These developments include:

● **Competency Based Qualifications and Assessment Only Qualifications** – Western Governors University was established to coordinate prior learning recognition for learners

across the United States and to offer degrees based on the assessment of competencies and capabilities. More recently, the University of Wisconsin and others have offered "flex" degrees which use anytime assessments to determine whether or not a candidate has the required knowledge and skills to earn a diploma or degree.

● **MOOCs for degrees** – India, Malaysia and other jurisdictions have developed systems by which credit earned by learners enrolled in MOOCs can count towards degrees or other qualifications. Some MOOC providers, such as FutureLearn, offer degrees, diplomas and certificates through their MOOC platform.

● **Micro-Credentials** – these are currently offered in a variety of fields in colleges and universities around the world, especially computing, social media marketing, human resource management, digital architecture, supporting individuals with disabilities and in teaching. Many are offered through intensive workshops, online learning or in a blended learning (combining face-to-face and online learning). The range and depth of these credentials is expanding rapidly and more of these credentials are becoming "stackable" so that learners can use them as part of certificates, diplomas and degrees. Some jurisdictions, such as New Zealand, see these developments as critical responses to the skills shortages they are experiencing (Graham-Riley, 2017).

● **Work-Based Learning Accreditation** - In many parts of Europe, qualifications can be earned through work-based learning activities. Learning at work, such as specialized skills development in an auto-repair shop, leadership development in a financial services organization, enabling new technology in a manufacturing plant can all be used to build a learning portfolio suitable for a degree or diploma or other formal qualification. Here are some specific examples:

- In France, employees can build a portfolio of their work – projects, analytical assessments, reviews and evaluations – and offer an analysis of this work so as to obtain a degree by work-based learning. The process here is like that used to provide graduate degrees for published work, though in this case the e-portfolio provides the basis for this evaluation (Papp, 2014). Similar programs exist at many Universities throughout Europe.

- In Finland, some 5% of competence-based qualifications (a technical and vocational education qualification system for adults) are obtained without the learner undertaking any type of formal instruction; instead, workers obtain these qualifications through validation of learning acquired through work experience and other non-formal means (Nevala, 2010).

- Joint Qualification Certificates (JQCs) in France are pivotal to vocational qualification in France. A JQC is a document issued by professionals certifying that the holder has mastered the set of skills required for a specific activity. JQCs reflect the qualification needs of the corresponding sector and are developed for specific activities for which there is no equivalent degree or professional title. They enjoy sector-wide recognition and are typically proposed by one or more sectoral unions. Their content is developed by joint technical groups composed of social partner representatives. The final decision to create a certificate is taken by the national joint employment committee of the sector, a body responsible for promoting vocational training to meet the needs of changing labour markets. The advantage of

JQCs is the speed of the system. It takes three to six months to create a new JQC compared to three to five years to create a new degree with the French Ministry of Education. The specifications for a newly created JQC include an updating process to ensure that certificates always reflect the current reality of the activity in the workplace (CEDEFOP, 2010).

- McDonald's University is a modular program offered by the restaurant chain for management development in company owned learning centres around the world. Manchester Metropolitan University (UK), as well as many other post-secondary institutions around the world, has imported these modules into what is known as a "shell" program (a degree framework based on modular outcomes and competencies) and then given credit to individuals who complete the McDonald's program and the associated evaluations and projects. Notice that the University does not design this program nor does it teach or assess it – the credit is granted on the basis of an articulation and competency framework agreement between the company and the University. In the US, some 1,600 colleges accepted the McDonald's program as partial credit towards a degree through similar articulation agreements.

- At Middlesex University's Institute for Work-Based Learning both professional master's and doctoral programs (MProf/DProf) have been developed. Currently more than 350 candidates are studying for the DProf degree. They are advised by the Middlesex academic team, senior professionals in their specialist areas and staff in the international centres run by the Institute.

- At the University of Derby (UK), work-based experiential learning can lead to up to 50% of a master's degree or the equivalent of the first two (of three) years of undergraduate study and up to one third of the final year of the baccalaureate.

Underlying Patterns of Change in Education Beyond School: Learning for the Emerging World

These several developments all speak to increased access, flexibility and innovation in post-school learning. When we explore what lies beneath these developments, we can see these patterns:

1. Diversifying the time and place for learning. Learners will have more opportunities to learn at different times in different places. eLearning tools facilitate opportunities for remote, self-paced learning. MOOCs and work-based learning can be pursued through a variety of settings with varying levels of support. Micro-credentials and assessment-based learning recognition require minimum space and time commitments. The hallmark of this development is flexibility.

2. Personalizing learning. Learners will learn with study tools that adapt to their capabilities as a learner. This means above average learners shall be challenged with harder tasks and questions when a certain level is achieved. Learners who experience difficulties with a subject will get the opportunity to practice more until they reach the required level. Learners will be positively reinforced during their individual learning processes. Learners can also construct their own route to success. Our schools, colleges, polytechnics and universities are already using adaptive learning systems to enable this.

3. Enabling Greater Choice. Though every subject that is taught aims for a specific destination (a badge, a certificate, diploma, degree, apprentice qualification), the road leading towards that destination can vary for learners. Similarly, to the personalized learning experience, learners should be able to modify their learning process with tools they feel are necessary for them. They should be able to plot their own route to the destination. Learners will learn with different devices, different programs and techniques based on their own preference.

4. Developing and Expanding Project-based Learning. As employees are adapting to the future economy, learners of today will adapt to the new forms of work and organizations through project-based learning and working. This means they have to learn how to apply their skills to real world and wicked problems and to a variety of situations (Murgatroyd, 2010). Learners should be fully acquainted with project-based learning in high school. This is when organizational, collaborative, and time management skills can be taught as basics that every learner can use in their further learning and work careers. But all levels of education should require project and team work, since these are essential skills for the new forms of work.

5. Facilitating Work Experience. Because technology can facilitate more efficiency in certain domains, curricula will make room for skills that require human knowledge and face-to-face interaction. Schools, colleges, polytechnics and universities will provide more opportunities for learners to obtain real-world skills that are representative to their chosen jobs or career paths. This means curricula will create more room for students to engage in internships, mentoring projects and collaboration projects.

6. Encouraging all Learners to Develop Data Interpretation and Analysis Skills. Though mathematics is considered one of three literacies, it is without a doubt that the manual part of this literacy will become less relevant in the near future. Computers will soon take care of every statistical analysis and describe and analyze data and predict future trends. Therefore, the human interpretation of these data will become a much more important part of the future for mathematics, science and other forms of education.

7. Rethinking Assessment. As courseware platforms will assess learners' capabilities at each step, measuring their competencies through traditional exams and assessment might not suffice. Assessment of competencies and capabilities is at the heart of emerging patterns and needs significant overhaul across our education system.

8. Promoting Learner Ownership of their Learning Journey. Learners will become more and more involved in forming their learning and program of study. Maintaining a curriculum that is contemporary, up-to-date and useful is only realistic when professionals, employers and learners are involved. Given the speed of change in both work and our understanding of knowledge, learners need to be able to design their own qualifications as well as follow established pathways.

9. Supporting Mentoring. In the coming years, learners will incorporate so much independence in to their learning process, that mentoring will become fundamental to student learner success. Teachers and instructors will form a central point in the

tangle of information that our learners will be working their way through. Guidance and support systems (driven by AI) coupled with mentoring and peer support networks are essential for learning.

All of this can be enabled by emerging technology, both for teaching and for student support services. The underlying key will be the need to reimagine the organizations that deliver such learning. Interesting protypes of such organizations are emerging, including Woolf University (Cox, 2018) and Tecnológico de Monterrey. This latter Mexican private non-profit university has adopted TEC21 as its framework for learning, which involves:

● Challenge Based Learning, where students develop disciplinary competencies while solving real world challenges with companies, government entities and NGO's.

● Flexibility in the how, when and where our students learn, leveraged by technology.

● A memorable higher education experience that will provide an experience of professional and personal growth.

● Inspiring faculty, where professors are agents of positive change, innovators, and use technology as a teaching aid. Their work remains deeply personal – engaging learners in the risk of learning.

CONCLUSIÓN

The future is not a straight line from the past. It involves significant and substantial change and needs to do so if we are to respond to the significant shifts occurring in society, the environment and the global economy.

Education, whether in school or beyond, is a vehicle for enabling each individual to develop the knowledge, skills and capabilities they require to lead both a fulfilling life but also to be a difference maker. Learning systems and institutions need to enable the passions and beautiful risk of education for each person (Biesta, 2014) and focus on providing a basis for each person to live a life of meaning and purpose (Aris and Murgatroyd, 2017).

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