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Forever Changed! Innovation and the Future Post-Covid Higher Education Landscape

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Abstract

One of the areas most affected by the covid-19 pandemic is the Higher Education (HE) sectors. With the coronavirus sweeping across the nations globally, most universities and colleges had to be shut indefinitely to mitigate the spread of the contagious infection. Consequently, in order to continue running their courses and their other operations, most HE globally took to online operation such as eLearning, and through platforms such as Zoom, Google Meet, Webex, Microsoft Teams, among others. Even though some HE institutions initially faced challenges, many were able to weave through the challenges and continue their operations online. But perhaps an important issue to ask is if the Higher Education landscape will remain the same after the covid-19 pandemic. The current paper is based on the authors lessons from the pre-covid Reimagine Education global competition and conferences, and their work during the current crisis on identifying opportunities in times of crisis. It is hoped that HE institutions, corporate training departments and faculty globally will benefit from the enriching discussion presented.

Keywords: Artificial Intelligence; Covid-19; Corporate training; Edtech; Higher education; Innovation pedagogical approaches; Innovation; Reimagine Education; University of the Future

Introduction

Perhaps at no time in recent history has Higher Education (HE) had to re-think its position and relevance than in the current covid-19 season [1]. Globally, institutions were closed and the shift to online education adopted. In a recent survey by International Association of Universities (IAU) on HE around the world, the institutions in the study reported moving their teaching and learning to distant, remote or online as a result of the pandemic, even though infrastructural challenges among others were encountered in the process [2]. Thus, the shift, while painful and with initial teething problems for some institutions [3]. Has resulted in many useful lessons for universities and colleges, edtech companies and corporate training departments.

As a result of the covid-19 pandemic, online learning globally has experienced a sharp increase. Coursera has reported a 500% year-on-year growth in participants in just couple of months, while Coursera for Campus launched last October. In February, there were just 30 universities using the platform, but since a free offer was announced on March 12, more than 10,000 institutions have signed up [4]. Overall enrollments have reached 1.3 million students taking courses through Cousera for Campus as a replacement for in-person classes. Similarly, Anant Agarwal, CEO of EdX confirms that 63 MicroMasters currently available on EdX now have 8 million enrolled students, from a launch just 2 years ago [5]. This highlights the urgency of reexamining our current higher education paradigm, challenging it and even changing it.

Like in Chinese, where the word 'crisis' is represented by the character that means 'danger' as well as 'opportunity'[6], or in John D. Rockefeller's words "I always try to turn every disaster into an opportunity", the covid-19 crisis presents innumerable opportunities for the global HE sector. The pandemic has given HE institutions a number of invaluable opportunities that if strategically tapped into, will bring about the betterment of the sector. To this end, it would be unfortunate after the crisis, for institutions to go back to the traditional pre-covid times, as this would represent a missed opportunity.

Already, many non-educational businesses have tapped into the opportunities availed by covid-19, for example; by having their employees work from home, internationalization of business or bringing on board newer global audiences, and adopting newer digital platforms such as Zoom, Webex, Google Meet, among others for their meetings, sales processes and other interactions [2]. What this suggests is that the business world, HE sector included, has inevitably changed. Consequently, embracing the new landscape should be the pre-occupation of universities and colleges today, rather than mourning about the past [7].

Besides loss of revenue over disrupted businesses, HE institutions have also faced additional challenges that have necessitated adjustments. On a number of occasions, students whose classes were disrupted have demanded tuition refunds, with over 70 institutions in the US getting sued over the matter [5,8]. Further, there have been arguments by students and other HE stakeholders for the need to reduce fees for online classes as the benefits do not match physical teaching and learning in the institutional environments [7]. Therefore, pressures such as the foregoing offer universities an unparalleled opportunity to challenge and even change their models of operations and those of their business and revenue models. Even then, the pressures to incorporate effective online education in the higher education offerings, to reduce the cost of education and address the growing educational, digital, economic, racial and ideological divides are not new. They are part of the challenges that the higher education faced in the pre-covid world.

- The current study is guided by two objectives:

Materials and Methods

The current study is based on the work of the two authors: the first author's work 'Transformation in Times of Crisis' [9]; the second author's research 'QS Student Pulse Survey-The impact of COVID-19 on the Future of Higher Education' [10], as well as the two authors' joint work at Wharton QS Reimagine Education global competition and annual conference [11].

This study was carried out at three stages. The first stage involved reflection on the thousands of Reimagine Education Award submissions and hundreds of presentations by thought leaders to identify the key challenges facing higher education.

The second stage involved the analysis of over 2,600 submissions (not reported in this study) to Reimagine Education in 2018/19 to validate the challenges and to identify innovative initiatives. This included the identification of major areas of innovation amongst short-listed and winning entries (winners are featured on the website. selected by hundreds of judges based on the innovativeness of their approach, the evidence of impact on student engagement and improved outcomes, as well as the scalability of the project. The applications and shortlisted entries by 14 categories are presented in **Figure 1**.

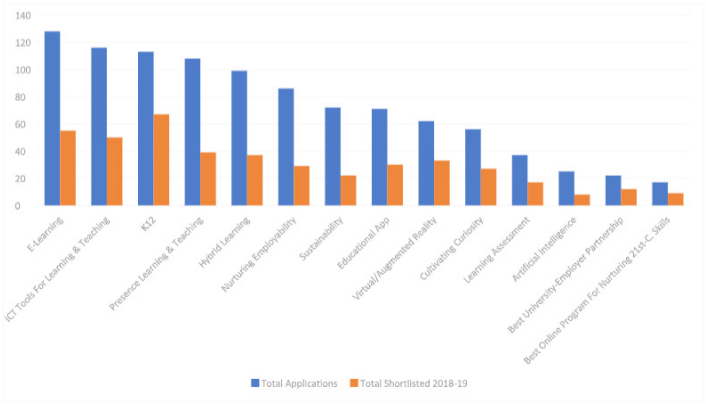

Figure 1: Applications and Shortlisted entries to the Reimagine Education competition 2018-19 by award category.

Applications were received from organizations in 91 different countries, with the largest number-204 applications- coming from the USA, 72 from the UK, 68 from Mexico, 57 from India and 52 from Hong Kong. Analysis of the entries and winners and reflection on the insights from the six annual Reimagine Education conferences led to the identification of ten "areas of innovation" believed to be pivotal to the future of higher education.

The third stage involved validating these "areas of innovation". This was done through presentations to live virtual expert audiences during the Summer of 2020, at EdTechWeek North America in June as well as the iFEST Conference of leaders in distributed learning from the US Department of Defense, NTSA and NATO.

The current paper presents ten "areas of innovation" believed to be pivotal to the HE of the future and the audiences reached by them. Challenges associated with the HE sector prior to covid-19 and which necessitate the innovation, are first discussed.

Higher Education Challenges

Pre-crisis, the entries to the global Reimagine Education competition and the keynote addresses and panels of the associated annual conference suggested ten key challenges for higher education; these were: eLearning seen as inferior to the classroom; limited acceptance of flipped classrooms and innovative pedagogical approaches; failure to develop efficient models for experiential learning; not taking advantage of the opportunities of data driven personalization; limited utilization of the latest technologies, like AI; despite advances in learning science proving that lectures are less effective, there remains an over reliance on this old pedagogical approach; much of higher education did not address the needed 21st Century employability skill; teacher-led assessment is difficult to personalize at scale and new forms of assessment are necessary for the online classroom; too expensive and limited access to education; and a narrow focus on traditional

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undergraduate and graduate degrees ignoring the need for lifelong learning and education and employer collaboration. Generally, these challenges can largely be categorized under technological, pedagogical, and access-related.

Prior to the covid-19 pandemic, many HE institutions globally had casually adopted technology for their teaching and learning processes. Despite aspects such as the flipped classroom having numerous benefits for the learning process, not many institutions had adopted it. To a large extent, eLearning has long been viewed, and even more recently, as inferior to face-to-face learning [11,12], and the data-driven processes not given pre-eminence [13]. The slow adoption of latest advances in technology in the HE sector prior to the COVID-19 pandemic stagnated the growth of the teaching and learning processes. Further, the acquisition of digital skills, especially among university professors is crucial for learners' attainment of 21st century skills [14].

Pedagogical challenges also characterized pre-covid HE institutions globally. With limited adoption of technology, many classes were dominated by the traditional lecture method which consequently led to rote learning. For example, in Bangladeshi, Mannan [15] observed that though the nation has a long history of university teaching, traditional lecturer method led to rote learning among the learners which consequently hampered critical thinking and creativity. Notably, the acquisition of 21st century skills cannot be achieved via the use of traditional methods of teaching and learning in universities. The pedagogical approaches, the technological skills in use and the reliance on traditional structure of educational offerings has limited the willingness to challenge the traditional mental models of education and reinvent them.

During pre-covid times, access to higher education was largely pegged on physical space, consequently leading to low enrolment in universities [11]. Except for cases of MOOCs that have given access to many students globally, HE has largely been out of reach for many. This is especially the case for regions such as Africa, Asia and South America, which traditionally would require university education for economic development [4]. Thus, though many students graduate from high school, university access for many is still a challenge globally.

Towards a New Higher Education Paradigm

In view of the global pandemic, the subsequent economic downturn and rise in unemployment, as well as issues such as the call for social justice in response to the Black Lives Matter movement - what has been the impact on higher education? This section focusses on ten suggested areas of innovation, informed by successful applications to Reimagine Education Awards. Arguably, a focus on these areas can help universities to reimagine their offerings and move to a new higher education paradigm, which will widen access, increase efficiency and lead to better learning, better career outcomes and personal growth and have a positive social impact.

Improved eLearning for life-long education of larger global education markets: COVID-19 has brought about a radical transformation in Higher Education delivery [16,17]. QS Institutional Pulse Research in 2020 reveals that University Leaders are responding by adapting their educational delivery rapidly, with 35% predicting an educational model that will be mostly online, whilst 72% are delivering part of their courses online. QS Student Pulse data confirms that the pandemic is pushing students to accept online learning as a viable alternative to presence learning. 44% of responding students will now accept studying for their Bachelors or Master's degree online.

Another force that is pushing for enhanced eLearning, whether in its pure form or as part of a hybrid educational model, is the growing global needs for lifelong education that offers the learner the needed 21st century skills which are a must in assuring employability [18]. Data from QS Global Employer Survey of 47,000 employers reveals that employers expect artificial intelligence to replace between 50-70% of technical and quantitative jobs, which increases the need for softer skills like; leadership, creativity, team-playing and resilience. At the same time, it is critical that learners feel comfortable augmenting their capabilities with AI and other advanced technologies. Even before the crisis eLearning attracted the largest number of applications to the Reimagine Education competition [19]. This is expected to increase and be driven by advanced applications of AI, machine learning, gaming, facial and voice recognition, VR/AR and mixed reality applications and our improved understanding of the neuroscience of learning.

An example of an eLearning 2019 category winner at Reimagine Education was OPEN Studio, which is a visually rich digital learning platform with a firm foundation in collaborative design thinking. Developed by the Open University UK for use within its Virtual Learning Environment, OpenStudio helps remote students feel less isolated and learn important feedback skills that would more naturally be developed in a physical space. It has successfully evolved from a small pilot to an important part of the OU's teaching delivery toolkit. By blending technology, user-centred learning design, and academic research, it created a natural and vibrant social learning experience. When presenting this concept to the audience of 130 education experts and venture capitalists at the latest EdTech NY conference, 77% of the audience agreed with the concept. In response to the question what one word of phrase best describe your reaction to this concept the dominant words were 'obvious', 'optimistic', 'skeptical', 'necessary', 'upskilling' and 'efficient'.

The mandatory shift to online education has brought with it, in very short time, huge advances in the available technology that facilitate interactive learning and a surge in innovative initiatives to enhance the learner experience, engagement and learning. It is anticipated that efforts to speed up HE digital transformation and enhancing of their digital infrastructure and capabilities would continue. The new reality of eLearning has demonstrated to students, faculty and administrators the value of eLearning [20] and it is inconceivable that any will ignore this experience and after the crisis go back to the traditional classroom teaching. The hybrid learning model is here to stay. The search, however, is for the innovative next generation flipped classroom.

The recent advances in eLearning are encouraging but are not enough to address the challenge of lifelong education. To date, the urgent need for lifelong education has been addressed primarily by non-degree executive education type programs. The implications of lifelong education to the traditional degree programs have been ignored. This cannot continue. The traditional degree programs

have to be challenged.

Transformation of current pedagogical approaches: Before the crisis hybrid learning (also known as blended learning because it involves time in a classroom as well as online) was the fifth most popular domain for Reimagine Education entries. The new eLearning reality is speeding the shift to blended learning as the dominant model of education. This has huge implications to the concept and process of learning as well as to learning spaces and schedules. The benefits of effective blended learning include: active learning; personalization to individual learning styles and flexibility that allows slow learners to repeat the eLecture until the material is understood, and fast learners to go at their preferred speed; enriching the "lecture" part of the education process with videos, animation, games, AR/VR, mixed reality and other ways that enrich the learning experience and engage the learner; incorporating hands on application of the eLearning material; teamwork; and assessment based on the ability of the learner to comprehend and apply the material studied [20, 21].

The hybrid learning models have huge implications to the physical learning spaces [22]. Amphitheater style classrooms and the famous Harvard Business Schoolrooms designed for case discussion are likely to be rendered obsolete. Open spaces which will allow for flexibility and many forms of group interactions (while maintaining the needed social distance) offer opportunities for creative architecture and interior design incorporating the latest technologies and facilitating experimentation with the impact of colors, lighting and other interventions on the effectiveness of group interactions and learning [23].

Another HE area that has been largely ignored is scheduling. Most universities operate based on the implicit belief that knowledge is best learned in increments of 80 minutes twice a week for 12 to 13 weeks [24]. While this is convenient for administrative scheduling, its contribution to learning effectiveness for various subjects is questionable. The blended learning model offers a unique opportunity to experiment with endless scheduling models [25]. Consider the example of one of the most popular and effective Wharton courses, the marketing strategy course taught by Professor David Reibstein. The course with 144 students and long waitlist meets for five consecutive days for up to 13 hours a day and involve lectures, group work (24 teams of 6), two group reports, a simulation, and an exam with daily quantitative feedback. The course has been run both in a traditional classroom environment and recently online with rave student feedback.

In rethinking scheduling, it is not enough to challenge and reinvent the current course schedule but we need to rethink the entire educational program. Is a four year undergraduate degree the right solution for building a foundation for lifelong education? Is a quarter or semester-based structure the right way of structuring the program and how can we incorporate the concept of Just In Time learning and, more critically, Just In Time learning and implementation into our educational structure.

Most critical is the need to challenge the current educational philosophy. Few HE institutions have had the courage to do it. Minerva is a great example for an innovative paradigm that challenged almost all aspects of a traditional undergraduate education [26]. Positive education is another area of great promise. At its best it integrates the positive Psychology framework of PERMA into educational models as a way of decreasing the students' depressions and enhancing their well-being and happiness. The PERMA model developed by Marty Seligman, the founder of Positive Psychology, includes the elements critical for long term happiness and wellbeing: Positive emotions, Engagement, (positive) Relationships, Meaning and Accomplishments [27]. Despite its conceptual attractiveness and successful applications in a few high schools (Winmalee High school in new South Wales), lower-level schools (Geelong Grammar School) and the US army, it has been ignored by most HE and to date we have not had any winning positive education entries to the Reimagine Education competition. We hope that this article will stimulate experimentation with more innovate pedagogical approaches based on the Minerva model and positive education.

New models of learning must provide for flexibility to respond to different user needs. Consider the flexibility offered by a tool such as Operation Outbreak the blended-learning platform to learn about the diffusion of infectious diseases which was developed by the Broad Institute at Harvard in collaboration with the Sarasota Military Academy [28]. This application won the 2019 Reimagine Education Hybrid learning award. It combines an academic unit covering relevant science and humanities subjects with a culminating 'disease outbreak simulation' experiential learning activity, which replicates a real-world outbreak scenario of a pandemic and guides hundreds of students on how to respond through a coordinated effort and use of mobile phone technology.

Efficiency in Blended Learning is also being driven by innovations in Holographic Presence of Lecturers. In 2018, Tec de Monterrey won a Sustainability Award at Reimagine Education for the use of Holographic Lectures which enabled the lecturer to be beamed simultaneously into multiple classrooms at their campuses around Mexico. This approach was further enhanced by Imperial College Business School which won the AR/VR Category in 2019 for Holographic Lectures in which the audience was also audio/video connected so that the lecturer could actually see the class and respond when they raised their hands or asked questions. This concept got 75% approval by the EdTech audience we had in our June 4, 2020 session. The words that best described the audience reactions were 'necessary', 'essential' even though it was coupled with skepticism and the audience's desire to see more. Importantly for HE educators, therefore, should be the ability to best integrate eLearning with physical interaction, considerations for the implications of the design of the learning spaces and what scheduling format will work best for the students, the subject and pedagogical approaches to be used.

Experiential learning, gamification and playful learning: One of the well documented observation about learning, which is largely ignored in educational practice, is that experiential learning is by far more effective than passive listening to a lecture [28]. During the recent proliferation of online learning, too many offerings have resorted to webinar and virtual lectures or panels on Zoom and other platforms not utilizing for example the room option on zoom that facilitate small group interactions [29], or augment the webinar with experiential learning options.

Games are probably the best example for engaged experiential learning; probably the reason why over 2 out of every 3 Americans play video games, mostly on their smart phones [16]. Video game players represent a diverse cross section of ages, gender, ethnicity, education and income. Many games are addictive and a whole industry has emerged experimenting with various forms of gamification to enhance user engagement. We would love seeing greater use of gamification and advanced gaming technology in learning going beyond the accepted simulations. Playful learning is a new movement aimed to leverage curiosity and play to enhance learning [30]. The Playful Learning Landscapes program took the learning from the classroom to the streets, parks, supermarkets focusing on young kids. The concept of playful learning – designing play experiences outside the classroom that focus on learning outcomes – should not be restricted to young kids and can apply to higher education and all ages.

Labster, from Sweden, was the Augmented/Virtual Reality Award winner at Reimagine Education in 2017. Labster gives students access to a realistic lab experience that enables them to perform experiments virtually-creating accessibility to high-tech science experiments at a fraction of the cost.

Pagamo, an innovative gamified learning platform from National University of Taiwan, won the inaugural Reimagine Education competition in 2014. Pagamo was a mobile video game in which students competed with other students to acquire virtual land and weapons to defend or expand their territory. Points were gained by answering questions correctly and more quickly than your fellow students. Pagamo was subject agnostic and has been adopted by academics teaching medicine, dentistry, mathematics and history. It remains very popular with students around the world. The concept got 67% approval by our EdTech audience and the words that best described the audience reactions were 'challenging', 'immersive', 'generational', 'money saver', 'resistance', 'very complicated', 'dangerous' and 'engaging'.

Learner centric and data informed personalization: The current crisis with its uncertainties and fears is a great opportunity to creatively engage the learner population and other relevant stakeholders. While being learner focused has always been important [17], few universities have truly excelled in putting the learner at the center and building its offering around their evolving needs. Among the more notable examples is the Interdisciplinary Center Herzliya, the first, non-for-profit university in Israel, which truly views the education process as co creation between the faculty and students [14]. Co-creation required courage and willingness to challenge the prevailing educations paradigm. As the trend toward personalization is one of the leading cultural and commercial trends of our time, education should not be an exception. With advances in technology and with more understanding of individual difference in learning and learning conditions, perhaps the time for personalized education has arrived.

The example of Century, an AI personalized learning platform used by schools, colleges and universities that won the Reimagine Education 2017 ICT tools for learning and teaching award suffice as an example here. Not only does the platform collect thousands of data points on each student's learning performance, but the AI engine processes this information to adapt to the future learning needs of the student in real time. Data informed personalization in an instant. Or consider the IE Business School's amazing WOW Room, from Spain, which won the same award in 2018. The Wow Room combines a Zoom Room type instructional experience with facial recognition technology and data analytics to measure the learner's engagement in real time, allowing the lecturer to adapt class delivery and call on student participation to reinvigorate the class. The concept got 43% approval by our EdTech audience and the words that best describe the audience reactions were 'engaging', 'privacy', 'expensive', 'not ready', 'culture clash', 'complicated', 'equity, but also costly', and 'destructive and disruptive'. Despite the low acceptance of the concept and some of the negative reactions, we strongly believe that being learner centric is a must and the time for personalization has arrived. To this end, HE educators need to ask themselves if they are being learner centric and if they are utilizing technological advances to personalize the education experience.

AI enabled education in a digital world*:* With the proliferation of AI and machine learning it is not too difficult to imagine a world where every learner would have access to AI tools on their smartphones [31-48]. A good example is the IBM Watson application at Sloan Kettering [45-49], which includes all the available knowledge on cancer in any language and any media, and which is helping physicians in diagnosing and treating cancer. What might be the educational implications of every student having a Watson assisted smartphone for any topic? Likely, this will change the balance of power between the faculty and students and speed up the shift away from the traditional education paradigm. This will also be critical especially when expanding the scope of learning to all ages, countries and conditions [48]. The increased focus on AI by a growing number of EdTech startups, the proliferation of AI in all domains, and the advances in emotional AI and the integration of AI-based language models, such as GPT-3 with Computer Vision are making this vision a much closer reality.

Consider for example Squirrel AI learning platform that replaces the human tutor with AI enabled algorithms that provide the students supervised adaptive learning experience. At the time of winning the Reimagine Education 2018 AI award, it had operations in 1,700 schools in more than 200 cities in China. Another example of AI enabled e-learning is DuoLingo, from the USA, which was the e-Learning category winner in 2016. Duolingo uses millions of datapoints, machine learning and advanced analytics to identify which bite-sized learning sequences provide the best language learning outcomes for students, adapted to their native language. DuoLingo had already become the world's most popular language learning provider, at time of application. Over 300 million students have received improved learning outcomes by following these online classes compared to traditional classroom-based language learning. Use of AI also fundamentally changes the business model, enabling millions of students to study languages for free, or pay much lower course fees.

AI on mobile is also being adopted to enhance the student experience [37]. Deakin University of Australia won the Award for best Educational App in 2017, for Genie, which was an AI enabled mobile platform that provided 24/7 customer support for every student on the Deakin campus. Services range from; scheduling and finding classes, to ordering library books, to ordering coffee. The concept got 28% approval by our EdTech audience and the

words that best describe the audience reaction were 'data privacy', 'replacing teachers', 'equity', and 'too impersonal'. Despite this low acceptance, the scenario that every student has access to an AI powered personal assistant (such as Watson) is the end of education as we know it and the beginning of a new learner-centric and empowered education. Notably, as this is bound to happen, a concern for higher educational stakeholders is how ready the education providers are.

Curriculum and pedagogical innovations based on neuro and learning science: Advances in neuroscience are continuously enriching the growing field of learning science. This requires closer interdisciplinary collaboration between neuroscientists, learning scientists, AI and machine learning scientists and the substantive knowledge experts in all fields. In this context it is instructive to appreciate the scope of the Wharton Neuroscience initiative, which according to Michael Platt, its founding director, is to "forge a new discipline drawing on neuroscience, behavioral science, data science, psychology, economics, marketing, management, evolutionary biology, and anthropology" [39]. To date, despite a large number of intriguing innovative pedagogical approaches we have not seen any entries to our competition that leverages these rich new perspectives. We do hope that this paper will stimulate more experimentation with these new disciplines which are critical to the next generation learning science theory and applications. Among the innovative pedagogical entries of special note are Lyfta, LSE and PeerWise.

Lyfta from the UK, which was the overall EdTech winner in 2019, brings excellently crafted immersive story worlds into classrooms so that children can discover exciting new places and inspiring people from around the world. Lyfta also provides visually stimulating multimedia content and powerful short documentary films, and its quest tracker (which communicates the tasks the teacher has designed in his/her lesson plan) "scaffolds" each child's learning experience so they can explore and learn independently. Lyfta demonstrates dramatically improved learning outcomes for autistic children.

London School of Economics from the UK was the overall Education winner in 2018. It received recognition for 'Students as Producers, which uses learning science to take the flipped classroom to a new level. Over 40% of LSE's classes in several disciplines are now taught entirely by the students themselves. Students use online learning materials to build their knowledge of a topic and then take turns to use the audio-visual and other materials to produce the class materials and deliver the class, only supported by the professor who remains entirely in the background. Peer-to-peer learning is gaining an increasing following, working on the principle 'nothing enhances learning better than being tasked with teaching the topic to your classmates'. Approval ratings amongst students for these self-taught classes consistently exceed ratings for classes taught by professors.

PeerWise from University of Auckland in New Zealand was overall Educational Award Winner in 2018 for its Peer-to-Peer Assessment tool, but also involved Peer-to-Peer teaching and coaching for exam preparation and had grown to 340,000 users globally entirely as a self-managed community with no budgets, or revenues. The concept got 91% approval by our EdTech audience and the words that best describe the audience reaction, were 'inspiring', 'learner centered', 'personalized', 'helpful', 'accessibility', and 'game changing'. In addition to inspiration from these winners, educational stakeholders should also consider theories and findings from neuroscience in the design of these pedagogical approaches.

Focus on ethics, values and employability skills for the 21st century: Even before the global COVID-19 pandemic and its attendant economic crisis and effect on employment, there has been an increased demand for having employable 21st century skills [30]. There has been the proliferation of skill-based programs such as coding boot camps, with guaranteed jobs upon successful completion of the program and the creation of hundreds of clusters of offerings with certification by Coursera and EdX in diverse fields focusing on employability ranging from Mini MBA offering to cloud computing, basics, starting your own app or business and introduction to individual skills management. The demand for online education with 21st century skills has increased significantly during the pandemic and expands from the traditional segment of college age students to lifelong learners who use these either to augment their traditional college degree or in some cases replace the traditional degree route [18].

A critical role of universities and all providers of education is the focus on ethics and values. Basic values such as the importance of truth, science and democracy are as important as the fashionable focus on STEM or even STEAM (when adding the arts to science technology engineering and math). The values and skills all universities should promote also include problem solving and critical judgment, creativity, love of learning, in depth knowledge of at least one discipline and ability to work with other disciplines, cultural sensitivity, values and ethics, motivation and leadership. A great example for the interrelated focus on employability and values is Williamson College of the Trades, the 2016 winner of the Reimagine Education ethical leadership award. They offer an innovative approach to vocational training through an immersive educational environment focusing on charter and skill development of young underprivileged minorities. Their amazing achievements should serve as a role model for the integration of values and employability skills. These are critical for any civilized society and without them we will not see the end of corruption, greed, and dictatorial regimes.

Another great example for a value driven university is the Interdisciplinary Center Herzliya, which focuses on preparing the leadership of tomorrow and promotes liberty and responsibility by balancing individual growth, achievements and happiness with social responsibility.

Australian universities have been at the forefront of innovations to develop 21st Century Skills, recognizing that students as consumers are going to be increasingly demanding clear evidence of skills enhancements. RMIT University was the Gold Award Winner for Nurturing Employability in 2018. Global Virtual Work Integrated Learning (WIL) is an innovative pedagogical model for developing graduates' global competency and virtual, global teamwork skills that reflects real-world business practice. Global Virtual WIL brings students from multiple countries and time zones together online to solve a real-life business problem for a multi-national client. Students' use a range of online business technologies to collaboratively develop a solution according to

requirements set by the client. Global team members have the additional option to come together in the host country to present their solutions directly to the client and receive authentic feedback.

From the UK, emerged an innovative way to foster entrepreneurship. The University of Newcastle and UK National Union of Students co-funded an enterprise to be run entirely by a changing cohort of students each year, with governance provided on a voluntary basis by an experienced management team. Stu Brew is Europe's first ever microbrewery to be managed by and for students, with the sales profits being invested back into training and development for students and overall long-term sustainability of the enterprise. Reflecting the strong focus on student entrepreneurship at Newcastle, Stu Brew is run as a social enterprise to support student development and help improve their employability skills.

The concept got 92% approval by our EdTech audience and the words that best describe the audience reactions were group projects, necessary, access, practical, relevant peer feedback, critical alignment, win-win. Reflectively, HE should foster an aura of ethics and the fundamental values of truth, the importance of science, and democracy while developing the needed 21st century skills.

Assessment at scale using peer to peer and AI innovations: Assessment at scale and especially of personalized and experiential educational offering is a continuing challenge. Two promising solutions are AI based assessment systems and innovative ways of using peer-based assessment [50,51]. Some of the Reimagine Education assessment winners best exemplify this. JoeZoo, the 2017 winner which leverages "smart" assessment technology that uses existing educational apps, learning platforms and coursework to guide students in building their writing skills. At the time of the award they were used by over 13,000 schools worldwide. PeerWise, the winner of the 2018 assessment award had a system which allows students who use the PeerWise app to create and explain their understanding of course related assessment questions, and to answer and discuss questions created by their peers.

67% of our Ed Tech audience agreed with this concept and the words that best describe the audience reactions were 'accountability', 'social learning', 'helpful', 'group accountability', and 'effective measures'. At the HE level, educators should ask themselves if they are leveraging peer-to-peer assessment, or AI and other technologies in assessment, and especially, assessment of personalized and experiential educational offerings.

Broaden access by unbundling the degrees and diversifying the offerings and business and revenue models: The current cost of higher education even with its increased scholarship support is still outside the reach of many and contributes to the increased income and digital divide [11]. One other outcome in the US is the staggering level of student debt which is at all-time high [26]. Whether governmental legislation succeed in addressing these challenges or not, every University should challenge and change their current business and revenue models. One model for breakthrough innovation at an affordable level is Minerva, a startup university with a most innovative pedagogical approach and curriculum, exceptional quality and impact that charges slightly over $30,000 a year for tuition, fees, room and board [29].

Online education offers even greater scope for changing business models through scale. A great example is Georgia Tech's online Master of Science degree in Computer science the Reimagine Education 2019 winner of the best online program. This program offers at scale at a total cost of $7,500 an entire degree. As of Fall 2019 it had over 9,000 active students and over 2,000 alumni. MITX was runner up to Georgia Tech in 2019, for its Micro-master's in supply chain management. For less than $2000, a student can take the entire first Semester of the MIT Supply Chain Management course, online using the Edx platform. Students achieving good grades are then eligible to complete the full master's on campus, paying only for the outstanding segment of the course, corresponding to a substantial discount. This trend to unbundled degrees is likely to accelerate.

Another model is African Leadership University, which was Short-Listed at Reimagine Education in 2018. Rather than charge students in Africa at the time of study, it admits students entirely on academic merit and future potential with the entire three-year degree offered without charge. However, the student enters into a lifetime contract to pay a percentage of future earnings to the university. By having an active online alumni community, ALU has managed to keep default rates extremely low, providing a viable model for regional education within Africa and beyond.

Yet another online model is Smartly, developed by former executives of Rosetta Stone language learning, and which has re-branded as Quantic School of Business & Technology. Smartly also does not charge students for their online MBA; however, employers pay a fee to access the students for internships and subsequent employment. The challenge of this model is that it is very cyclical and in a time of crisis, employer willingness to pay could collapse.

The current crisis despite its negative impact on the balance sheets of many universities offers enormous business opportunities including: speeding up the needed digital transformation and creation of a digital infrastructure that allows expanding the digital offerings to global audiences; cost reductions and increased efficiency of operations; acquisition of available talent and potentially even M & A with other universities or EdTech startups or others who could help shape the future of Higher education; and strengthening the relationship with students, alumni, faculty, staff, donors and other stakeholders.

Covid 19 is likely to drive a need for new business models in Higher Education to reduce the burden on the individual and to take advantage of the scale economies offered by online learning [25,42,49]. Some of the models which can be explored alongside curricula innovations include: student loan repayment conditional on minimum agreed earnings levels (implemented in UK domestic market); employers paying tuition reimbursement on hiring; students paying for education via a contractual share of future earnings; government subsidies (implemented in Germany and several EU nations); alumni scholarships for disadvantaged students (implemented in many Western Universities); unbundled credentials offered for credit which accumulate to a degree. Students can purchase courses at different life stages based on need and affordability.

81% of the Ed Tech audience in our session agreed with this

concept and the words that best describe the audience reactions were 'access', 'future', 'interesting opportunities' to 'close the gap' but also 'financially untenable'. For the HE sector, this is a time to reflect on the business and revenue models, and the sensitive issue of access.

New knowledge networks founded on open innovation, talent and employment needs*:* Open innovation and open talent leverage the crowdsourcing model and is revolutionizing the talent strategies of many organizations [19]. NASA and many of the leading firms in almost all industries are relying heavily on open innovation and talent [27]. Not surprising the open innovation platforms are attracting increasing numbers of problem solvers. Top coder for example has over 1.5 million top coders and data scientists and a new network of open innovation providers and users is being organized by Open Assembly [38]. While universities have always used visiting and adjunct faculty, the growth of the open innovation and open talent trend with its proven performance of 4-5x faster and 8-10x cheaper than internal talent, challenges higher education institutions to explore new ways of leveraging this trend not only re faculty and staff hiring, but also in creating and orchestrating research and knowledge networks and engaging students, alumni and new lifelong learners with these networks.

Knowledge creation is not the monopoly of universities and the research arms of major technology firms such as Microsoft, Google, IBM, Facebook, Amazon, and others are power houses of knowledge creation [22]. Collaborating with them on faculty and doctoral research and bringing it to the curriculum is instrumental if universities are to stay current. Similarly, collaboration between the commercial arms of these companies and student projects and internships is a critical way of enhancing the relevance of the university educational programs. In general, the greater the needs for any educational program to address the needs of employability, the higher the need for collaboration with industry, whether in the form of internships, co-ops, programs or other.

An example of productive university-industry partnership is Queensland University of Technology, the 2017 winner of the Reimagine Education best university-employer partnership, which launched the Google online marketing challenge. This was the largest global student marketing competition to develop digital marketing skills while working with real clients and money using Google AdWords. 73% of our audience agreed with this concept and the words that best describe the audience reaction were 'necessary', 'needed', 'real world application', 'appreciative', 'entrepreneurial mindset', 'critical' and 'innovative'. In line with this, how might HE stakeholders benefit from open innovation and open talent and leverage their networks [50,51].

Conclusion

The dramatic and total shift to online education offers a unique opportunity to speed up the transformation of HE institutions to the university of the future. A university that addresses the challenges facing higher education and designing and implementing experiments based on the 10 'areas of innovation' discussed in the foregoing sections. When asked if they would take action as a result of the insights they had gained from our presentation of these 10 'areas of innovation', 92% confirmed that they intended to take action. Our audience at the EdTech conference when asked for the one word or phrase that summarizes their takeaway from the session in which we discussed the 10 principles used the following terms: 'thought provoking', 'forward thinking', 'inspiring', 'innovative', 'soft skills', 'exciting', 'global skills' and 'the future'.

Whether you are a faculty or administrator of a HE institution, or an executive focused on the educational needs of your corporation or organization, or one of the thousands of EdTech entrepreneurs, or one of the leaders of the many organizations in the educational ecosystem, are you ready to experiment with any of the 10 suggested guidelines for the future of education as summarized in **Figure 2**. To experiment with any of these approaches takes courage. Yet the rewards go beyond survival; they will lead to renewed growth and impact on the future of our learners and the short- and long-term future and impact of higher education and our entire society.

1	Improve eLearning for lifelong education
2	Transform the current pedagogical approaches – blended learning, learning spaces, schedules and educational philosophy
3	Experiential learning, gamification and playful learning
4	Learner-centric and data informed personalization
5	AI enabled education in a world in which every student has access to AI tools on their Smartphones
6	Curricula innovation based on neuro and learning science to improve learning outcomes
7	Focus on ethics, values and employability skills for the 21st century
8	Peet to peer and AI innovations for assessment at scale
9	Broaden access by unbundling the degree, diversifying and changing the offerings and business and revenue models
10	New knowledge networks founded on open innovation, talent and employment needs

Figure 2: Higher Education-Is this the New Reality?.

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Data Availability

Over 6000 distinct submissions have been made to the Reimagine Education Awards since 2014. For the purpose of this paper, 2500 submission made during 2018 and 2019 Awards were considered, of which 15% were shortlisted. All application data to Reimagine Education Awards, including judges scores and submissions, is the property of QS Quacquarelli Symonds Limited. To request access to the any of the data, please contact Jack Moran: Email jack@qs.com

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