UNIVERSITY EDUCATION IN A COVID-19 WORLD

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Abstract

The COVID pandemic has changed many aspects of our lives and none more so than how we provide education to thousands of university students in a locked-down world. Up to now the use of technology and engagement with students has followed a very traditional and standard approach. Universities and institutes have provided online learning platforms where technology was used as a support in limited ways. As academics and students were forced to isolate, technology solutions came to the forefront to provide an active learning environment. This paper examines the use of these technologies to provide interactive training and support to students. We reflect on different methods used for student engagement in providing lectures, laboratories, and tutorial support. Universities struggle to provide assessment methods that adequately evaluate the student's knowledge and understanding of the subject matter. Here we reflect upon and evaluate some of the lessons we have learned about how COVID has changed our perception of technology in education.

Keywords: *education, management learning platforms keywords, student engagement, on-line technology*

1. INTRODUCTION

As the impact of the global pandemic began to take effect in 2020 every aspect of life was affected and none more so than the education sector. Universities and institutes in the middle of their academic term were suddenly closed and they had to improvise and develop methods of online content and resources to students that were distributed nationally and internationally in lockdown. The challenges faced by these institutes to continue as "normal" required systems, academics and students to adapt on a daily basis. Many universities have centers for teaching and learning that provide support and resource to both students and academics. However, these centers assume an on-campus university model where learning is provided in formal learning environments. Many seismic shifts in educational pedagogy from formal learning towards informal learning and from a knowledge focus towards a skills focus are being implemented but sometimes at a slow and reluctant pace.

Jay Cross, in his research on workplace learning approach, viewed learning no about the transfer of knowledge, but should be about performing and working better[1]. Technology is having a profound effect on all aspects of education and online education in Covid has accelerated this process[2]. The impact of technology on education has been steadily increasing for the last 10 years. Some of the pioneering and leading universities have embraced this change and created professional online course delivery such as MIT opencourseware[3]. Others like Udemy and coursera are on-line platforms offering a number of peer-reviewed courses taught by professional tutors globally. Covid has accelerated the growth in education platforms over the last 18 months. Most universities had to develop online course delivery from a "standing start" away from traditional modes of education.

Most Universities have learning management systems which provide platforms that include learning systems, course management systems, content management systems, portals, and instructional management systems[4]. The use of these systems vary dramatically within and across different universities and also in the degree to which staff engage with the full range of their features. Typically, a learning management system provides an instructor with a way to create and deliver content, monitor student participation and assess student performance. As a result of Covid, learning management systems were used to provide content and other interactive features such as threaded discussions, video conferencing and discussion forums. Some popular LMS's used by educational institutions include

Moodle, Blackboard Learn and Schoology Table 1. Popular enterprise-level LMS's include Adobe Captivate Prime, Docebo LMS, TalentLMS, iSpring Learn and eFront[5].

• Eduflow	Best for corporate training and higher education
• Mindflash	Best LMS for larger enterprises and organizations
• Google Classroom	Best simple LMS course authoring tools
• Chamilo LMS	Best free digital learning management system
• Moodle	Best open-source learning management platform
• D2L Brightspace	Best for video assignments and game-based learning
• NEO-LMS	Best LMS for drag and drop dashboard widgets
• Schoology	Best LMS for third party integration
• Blackboard-learn	Best learning content reporting/analytics
• SAP Litmos	Best learning management for higher education

Table 1. Learning Management Systems

Source: https://thedigitalprojectmanager.com/best-learning-management-systems/

Most universities and institutes however engaged with technology through their LMS. In most cases 90% of students were located on physical campuses where lectures tutorials and laboratories were delivered face to face. Most of the interaction with students followed traditional modes of interaction with technology to support teaching and resources. Assessment also followed classical examination methods with the requirement to have less 100% exams in order to reduce stress on students and recognising the fact that not all students perform well in exam situations.

A number of countries are proactive in implementing change for example the Higher Education authority (HEA) Ireland, Innovation and Transformation Programme, aims at enhancing the digital attributes and educational experiences of Irish university students through enabling the mainstreamed and integrated use of digital technologies across the teaching and learning process. The project aims to mainstream digital in teaching and learning activities in Irish Universities, by addressing the professional development of all who teach or support teaching and learning. In the context of Covid-19, in May 2020 the project re-focused to support a move to a more blended approach to teaching and learning in the academic year 2020/21[6].

2. COVID WORLD

2.1. Pre-Covid

Educational institutions normally operate on a structured academic calendar and any plans or changes to this are slow to happen with curriculum modifications requiring up to two years. Over 80% of students are physically on-campus and the structure and delivery of courses were previously based on this physical model. The diversity of students has and is changing from traditional college entrance to mature and adult learners requiring reskilling or upskilling. The requirement to be on-campus for the changed student cohorts is, in many cases, impractical and restrictive. Participation in education has changed from long established models to learning throughout each person's working life. In many was a technology changes it is crucial to up skill to meet an increasingly digitalised economy. The labour market will change in a post-COVID-19 world and to reduce the increased number of unemployed retrain is essential [7].

In the pre COVID or BC "Before Covid" on-line courses by universities represented a very small aspect of delivery. Companies tended to use online training as a means to improve efficiency of employee time and reduce time away from the organisation. Even before Covid the growth in education technology or ed-tech had reached investments of over 20 billion dollars and projected growth in online education expected to reach 300 billion dollars by 2025[8]. The real impact of online ed-tech is its ability to reach a global market using language apps, video conference tools or mobile apps Figure 1.



Fig. 1. On-line course providers

Source: https://twitter.com/simplivllc/status/1076399191340007424

2.2 Post-Covid

The last 18 months of online education have provided us with a large amount of unexpected data and insights on the positives and negatives from this experience both from a technological point of view and the delivery an assessment for both academics and students. Online education it's not something that can be switched on and provided generically across the world. Limitations of adequate technology, internet access, computer equipment and necessary digital skills. The engagement of students and the ability of academics to delivering traditional work-based learning online is a real challenge[9].

One and a half billon students around the world, according to UNESCO, were engaged in remote learning at the peak of the COVID-19 pandemic in March 2020 [10]. The main challenges of post COVID education were the delivery of content to students in different geographic locations where technology access varied significantly. The Internet connectivity for students varied considerability, resulting in quality of service provision ranging from megabits per second to no connectivity. Fixed broadband access rates vary depending on the particular technology being used and the service being accessed, from file transfer, email access, interactive video and live streaming. Mobile technologies such as the rollout of 5G has enabled access via smartphones and tablets. Broadband access depending on one's location can vary significantly see Figure 2.

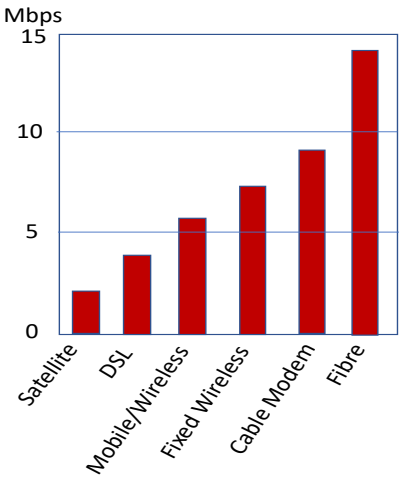

Fig. 2. Broadband Technology

The average broadband download speed in the U.S. is now 7.12 megabits per second, while the average upload speed is 2.42Mbps, according to the report "US Residential Broadband Speeds Accelerate," based on an In-Stat survey[11][12].

The second challenge for academics and tutors was to deliver content to students, some had no previous experience of teaching online or at a distance, new approaches to teaching and learning and imaginative ways to engage students. Some try to directly transfer classroom delivery methods to online lectures which failed miserably in engaging students. There is much talk on blended learning and how this can be used for online teaching, this provides new methods for student engagement Figure 3.

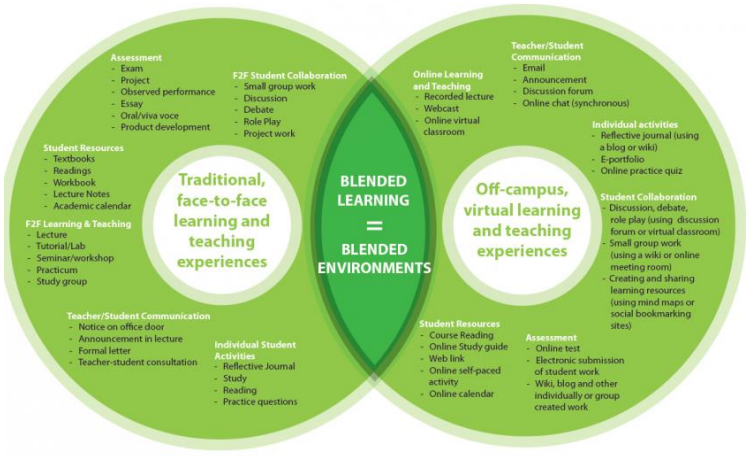

Fig. 3. Blended learning

Source: Possibilities for Blended Learning Source: Griffith University (2010

Blended learning have been introduced by universities as it means to engage as the demographic profile of students changes from face-to face classroom interaction. This allows for the opportunity for a more flexible approach to learning and allows academics and students explore new and teaching and learning.

Different strategies are used in different combinations to improve learning outcomes[13]. The motivation for blended learning is that it should enhance and develop skills and competence is to allow students to adapt to have ever changing workplace[14]. Education systems should develop students with

the skills for life such as critical thinking, problem solving, communication, innovation, digital literacy, and adaptability. How to achieve and developed his skills for all students is not very clear and it's a very complex problem that providing a lot of technology and online training may not solve. Moore and Kearsley [15] identified a number of key reasons in respect to distance education:

- Increase access to learning and training as a matter of equity
- Provide opportunities for updating skills of the workforce
- Improve the cost effectiveness of educational resources
- Improve the quality of existing educational structures
- Expand the capacity for education in new subject areas
- Offer combination of education with work and family life
- Add an international dimension to the educational experience

This highlights a different question that needs to be asked, if we embrace this new method of online education then the concept of regional based campuses may have a limited lifespan in this new world. Students attending these campuses are typically 70% from the surrounding region; universities provide accreditation of a degree or other qualification. If this service can be provided online in a blended manner then the question regarding the function of local universities and institutes arises. We have seen already the Ivy League universities have engaged with multinational technology companies to provide such programs. Below is a list of some of the top world ranking Universities offering online courses.

Harvard University	HarvardX program which is specifically created for online education. These courses alone are free but if you want to receive a certificate of completion, you may have to pay a small fee[16].
Georgia Institute of Technology	This Atlanta-based university has been offering online degree programs since 2012. Georgia Tech is ranked top 20 in the world [17].
Ecole Polytechnique	This French institute is known for its top-level research and use of cutting-edge science and technology to expand its academic programs [18].
Massachusetts Institute of Technology	Their online program is more popularly known as MIT Open Courseware. It features open publication of material from MIT's most popular degree programs from introductory to graduate degree levels[19].
University of the People	This online university is one of the biggest platforms where you can take free online college courses. It is absolutely tuition-free and is an American-accredited university. It provides open-access learning for higher education worldwide[20].
Carnegie Mellon University	There are several free college courses online offered by Carnegie Mellon University, one of the most renowned universities in the world. It's called the Open Learning Initiative[21].

University of California – Berkeley	Berkeley has a wide range of free online college courses that they offer through their Open Access University[22].
Yale University	Another Ivy League school, Yale offers a program called Open Yale Courses where you can choose from a wide variety of free college courses that you can take online[23].

Table 2. Universities That Offer Free College Courses Online

Source: https://robots.net/tech-reviews/universities-that-offer-free-college-courses-online/

It is important to remember that this is pre-Covid and University Education is a big business. Once these top-ranked universities engage and offer online programs the next step is getting accreditation from these universities without having to attend. This opens a mass market for global international education irrespective of your geographic location. The challenge will be for the many thousands of universities to compete with this model. One of the concerns which we will discuss later is the downside of online education is motivating learners. Evidence from Massive Open Online Courses (MOOCs) shows completion rates as low as 10%. In addition to basic digital skills, online learning requires autonomy and self-motivation [7].

3. PEDAGOGY OF TEACHING

Jon Andrews talks about pedagogy, Andragogy and Heutogogy where each is separated into teaching basic skills, implementing structures to enable self-directed and finally establishing an environment where learners can determine their own goals, learning paths, processes [24]. Online learning post-Covid has moved to Andragogy and Heutagogy where we move to facilitate and assist learners and act as a mentor as a sound board Table 3.

Learning	PEDAGOGY Teacher Led	ANDRAGOGY Self-Directed	HEUTOGOGY Self-Determined
Dependence	Learner is dependent Teacher determines what how and where and when anything is learned.	Learners independent Autonomy in learning They are "problem solvers".	Learners are problem Enders Focus on their Ditto their destination and who can take them to that route.
Reasons for Learning	Trust in the teacher and the efficacy of linear sequential learning learners take no responsibility for their learning.	Seek guidance/ mentorship. Independent responsibility for the direction of their learning.	Learning is not sequential or linear parents accept full responsibility for their learning.
Focus of Learning	Learning is subject centered and focused on prescribed curricula.	Goal driven focused on tasks. Cross disciplinary thinking and autonomy.	Inquiry driven. long term view after learning seeking further complexity and uncertainty.
Motivation of Learning	Motivation external e.g. Parents, teachers sense of competition etc.	Motivation is intrinsic High self-esteem from successful competing in challenging.	Motivation lies in knowing how to learn seek out unfamiliar situations to gain experiences.
Role of Teacher	Pre-designed learning process suggesting provides material deemed to be effective to achieve their goal	. Facilitators seek tasks but encourage diverse roles to solutions pursue mega cognitive in learners.	Coach bring together opportunity context external relevance and extended complexity Fosters culture or collaboration and curiosity.

Table 3. Pedagogy of Teaching

This new approach to online education for universities is an ongoing process and developments in online, blended and lifelong learning provision, with a focus on next generation pedagogy [25]. examines Intelligent, Distributed, Engaging, Agile and Situated pedagogy.

Where Intelligent pedagogy is an approach to teaching in which technology is used to enhance the learning experience. Distributed pedagogy refers to shared or distributed ownership of different elements of the learning journey by different stakeholders in the process. Engaging pedagogy is an approach to curriculum design and delivery in which learners are encouraged to actively participate in the learning process. Agile pedagogy refers to flexibility and customisation of the curriculum and the student experience. Situated pedagogy encompasses the idea of contextualisation of learning and emphasises the need for curricula with real-world relevance [26].

The perception when people consider online courses is that they are all very similar, traditional online courses and MOOCs. Traditional online courses, follow classroom curriculum which are delivered online facilitated by an accredited Universities. MOOCs, however are often short, stand-alone courses. Lectures are pre-recorded and accessible 24/7. There is no deadline to complete a MOOC and the course provider does not necessarily have to come from a college or university [27]. A study by Brandon Hall Group, eLearning takes 40% to 60% less employee time compared to traditional learning (Forbes, 2017). This results in significant cost savings for example Dow Chemical, which reportedly saved $34 million as it was able to reduce training course costs from $95 to $11 per learner after shifting from physical classrooms to corporate eLearning tools [28]. With about 90% of corporations now using online learning compared to just 4% in 1995 (LinkedIn & KPMG, 2015 & 2018), the business sector is bound to be one of the biggest growth drivers in the online education industry this decade [29].

It is because of this growing adoption that the global corporate online learning market is expected to grow to $50 billion by 2026, with an annual growth rate of 15% from 2020 to 2026 (Statistics Market Research Consulting, 2019)

4. ASSESSMENT METHODS

One of the concerns with regard to the impact of pre Covid is how to assess students that meets the standards and requirements of the universities. Assessment very dramatically from course the course and from university to university. Students had options on weekly assignments, reports online and oral examinations. Both academics and students had to rapidly adjust to this new form of assessment. A concern sometimes raised was the authenticity of the work submitted. Systems like proctoring were used to prevent students from cheating, however very few courses many universities or prepared already to incur the costs associated with this form of assessment. Proctoring in itself can lead to other problems of student assessment which does not always benefit the student assessment [ ].

The purpose of assessment is to evaluate and make a judgement on the collected material and the performance of the student. We can consider three methods of assessment that can be examined formative, summative and Holistic. Whatever one method chosen, assessment should always be based on clearly defined processes and specific standards rather than on opinions and feelings [ ].

Formative assessment takes place throughout a course. The learner is assessed and given feedback as they learn rather than at the end of the program. Summative assessment is described as assessment conducted at predetermined points in the learning process or at the end. Holistic, assesses a range of skills and knowledge. The methods and tools may assess a number of elements of competence or more than one competency unit at a time [ ].

Assessment of on-line and distance learning poses numerous challenges were competency-based programmes are being assessed.

- Collecting the material form the student
- Interpreting this information meets the learning outcomes.
- Making a decision on the student's level of achievement

- Validation of the authentic of this original work.
- Equal and adequate technology access
- Best teaching approach (enhanced face-to-face learning, blended learning), online)
- Evaluation formal and informal activities offered in synchronous or asynchronous

Leroux & Bélair, 2015 provided an excellent framework for the assessment of distance learning in a program with a competency-based approach [31].

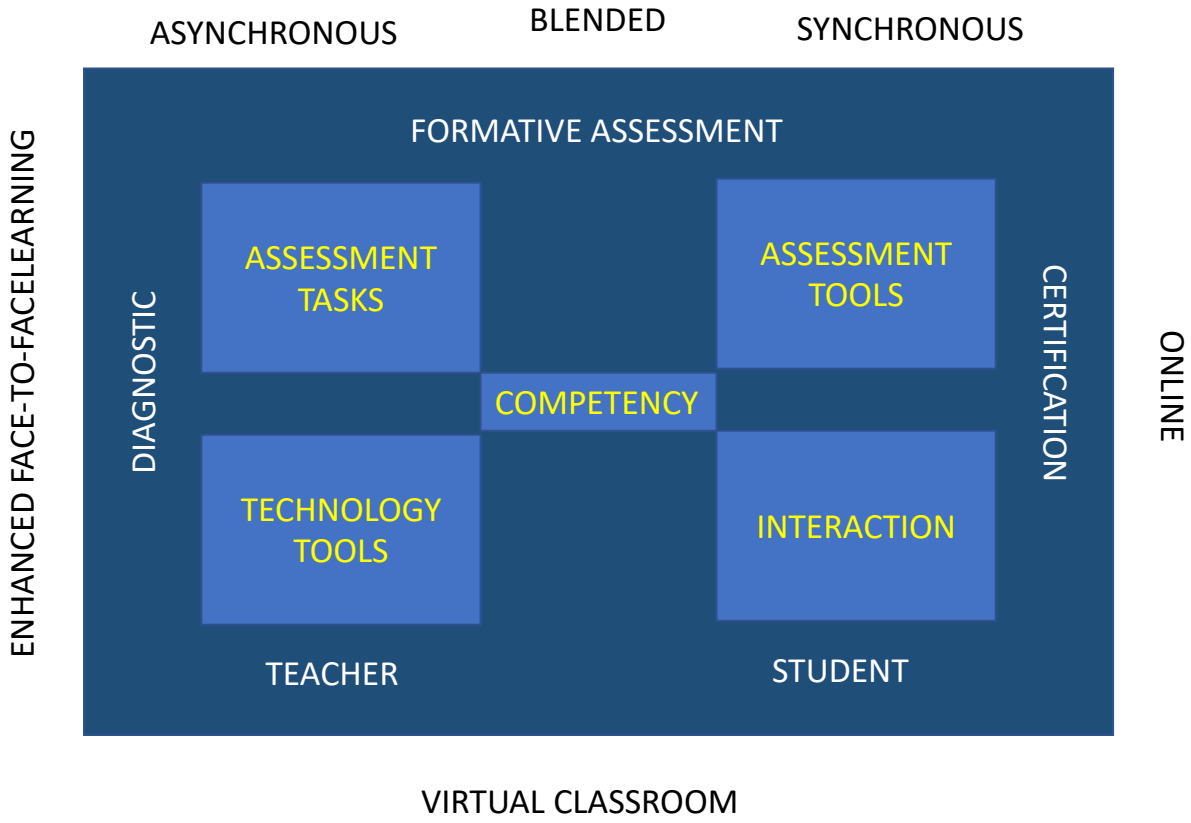

Fig. 4. Framework of Distance Learning Assessment

Source: (Leroux & Bélair, 2015) presented in the *Outil de questionnement pour la planification et la conception des évaluations d'un cours en FAD*

5. THE NEW WORLD

Higher education now operates within a rapidly evolving environment, and it is likely that this environment will be the driving force for change in the short to medium-term. This is likely to prove a challenge as it appears that Universities are not good at dealing with such change [33].

There are very significant differences between the natures of change in educational institutions and commercial enterprises. It is therefore unlikely to be helpful to undertake change using purely industrial models as they will tend to fail. The old adage that "nothing succeeds like success" has a corollary in the educational context that "nothing fails like failure." Repeated failures to implement change are in many senses worse than not trying at all.

The question of why any institution, educational or otherwise should change aspects of its operation is a conspicuous starting point for the development of an understanding of the nature of change in educational institutions. In an industrial situation, there is generally a straightforward answer to this question. Willman (1986) presents a comprehensive model of technological innovation (Abernathy-

Utterback model) which demonstrates clearly that Industry implements change fundamentally in response to threats to its profitability [33]. It should also be noted that in an ideal industrial paradigm, change will be implemented in whatever timescale is required to neutralise the effects of a perceived threat. Industrial change is fundamentally pre-emptive in nature as its function is to protect the organisation from being forced into a position of competitive disadvantage rather than to rescue it.

In the case of an educational institution, the idea of a planning process for institutional change followed by rapid implementation and 100% achievement of the original targets, exists only in the minds of the very naive. In sharp contrast to their counterparts in Industry, Universities are reactive in nature.

In many cases, change in Universities is often only in response to massive external influences as opposed to internal stimuli. Covid is such an element; it will clearly be impossible for universities to revert to pre-Covid environment. Covid has set the seed of change on all fronts, students, academics, universities and companies which see a massive new market and opportunity. The question will be, can all universities survive in this new world?

It is important to understand even though universities have highlighted the success of coping in this new world, many students and academics have struggled to embrace the changes associated with this new technology.

6. DISCUSSION

The concept of traditional education has changed radically within the last couple of years as technology platforms evolve. With the arrival of Covid this transition which was taking place in a progressive manner was accelerated beyond anyone's expectation in the last 18 months. A number of questions need to be answered with regard to this shock approach in respect online learning in relation to the technology and whether it's fit for purpose trauma, the academics and tutors their ability to adapt from traditional education delivery. The impact to the students is more complex in that it provided a different method of learning however the environment in which this took place due to covid-19 needs to be examined. Many students even though had access with other students and supports online they were in a very socially isolated environment.

One of the major issues is that online education systems that existed prior to Covid pended tended to provide content using a blended learning approach. The difficulty with these systems with regard two standards and accreditation very dramatically and lacked formal recognition. No however two universities and institute are providing online education and using traditional accreditation approaches for this online delivery. So the problem exists not just about advances or how we engage with students but how technology is changing our whole education system. Why do we need hundreds of academics to provide online content when companies like Google and Amazon can recruit leading academics in each academic field and provide this material on a global scale. The question becomes is it accreditation from a university work more then accreditation from Google or Amazon.

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