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CENTRE FOR ONLINE & DISTANCE EDUCATION

Navigating the Future: Literature Review

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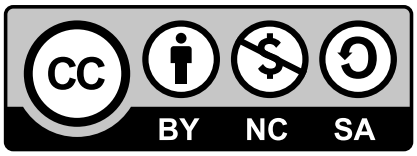


Contents

Introduction

The aim of this literature review is to distil key trends that may be significant for future mid to longer term planning for online and distance education. The study has been undertaken as part of the CODE funded project 'Navigating the Future', led by CODE fellow Jon Gregson.

The document is based in part on an earlier literature review 'Assessing the potential for likely developments in educational technology', by Tony Sheehan, for the CDE funded project 'Digital Educator Part 2'. July 2018. It was updated in 2022-2023 as part of the CODE funded project 'Navigating the Future' with additions by project team members Samantha Ahern, Stephen Brown, Jon Gregson, Norbert Pachler and Maylyn Tan.

See also 'Navigating the Future Final Report'.

Following an initial review in July 2018 by Tony Sheehan for the CDE funded project 'Digital Educator Part 2', 5 key clusters felt to be potentially significant to the digital educator of tomorrow were identified as:

1. The emergence and adoption of new technology
2. The adaptation of technology into teaching tools
3. Learner practices and acceptance of technology
4. Higher education sector trends
5. Wider learning industry trends

The field was subsequently revisited in 2022 in the aftermath of the Covid-19 Pandemic, during which educational institutions around the world faced a choice between closing completely or facilitating remote educational provision, predominantly online.

This review updates some of the earlier findings and identifies 3 additional clusters:

6. Digital Inequalities
7. Sustainability
8. Ethics

Inevitably, there are overlaps between these clusters and the final project report looks at how the clusters combine to inform the needs of the future digital educator as illustrated below.

Findings from each cluster, along with some initial (literature based) review of implications for online and distance education are illustrated in the following sections.

1. Technology trends and implications for learning – what is emerging?

Given the rapid growth in consumer technology at present, it is important to consider the rate at which such technologies may achieve widespread adoption in the Education sector and hence impact the digital educator.

Presently, more than four billion people globally have reasonable access to the Internet. More than 50%, or two billion people, do so only using mobile devices (Clement, 2020; International Telecommunications Union (ITC), 2021). Many are using their devices for learning (Mbabazi, Ali, Geoffrey & Lawrence, 2018).

The integration of technological tools, including learning management systems, lecture capture systems, and collaborative platforms, is increasingly becoming a part of traditional learning environments. The 2017 Survey of Online Learning by the Babson Survey Research Group indicated that distance education enrollments are increasing each year, despite the decline in overall higher education enrollments. In the United States, 31.6% of all higher education enrollments were enrolled in a minimum of one distance education course (Beirne & Romanoski, 2018).

Exacerbated by the pandemic, faculty members are under tremendous pressure to provide online and hybrid courses and they often struggle to translate their face-to-face teaching into an online environment. Consequently, Professional Development initiatives have included support from instructional designers to assist the conversion traditional face-to-face courses to online instruction (Belt & Lowenthal; 2020).

JISC's growing volume of horizon scanning reports provide some sense of the rapid rate of development and scope of potential impact of new technologies for digital education, pointing to the potential for technologies such as:

- **Blockchain** to provide a source of reliable data access and *'research provenance and reproducibility'* (Hamilton 2017),
- **Cloud computing** to save money improve storage, accelerate development, and enable agile development (Hamilton 2015),
- **Data and analytics** to support more effective predictive student analytics (Sclater et al, 2016),
- **Open access systems** to support new knowledge development (Hamilton et al, 2017) and
- **Artificial intelligence** for learning support and the generation of new knowledge (Hamilton, 2018),

Several of the potential benefits (in particular, cloud computing and open access) are already well recognised in higher education, and the JISC series illustrates the increasing breadth and growing complexity of technologies that could influence the educators and students of tomorrow.

1.1 Impact of A.I.

Gartner's analysis of strategic technology trends for 2018 highlights a further range of options; the importance of AI, the increased adoption of digital solutions that connect real and virtual worlds and the *'mesh*' of connections and possibilities that arise due to the continuous connection of people, '*things*' and data (Panetta 2017). In a separate report, Plummer et al (2017) highlight the rise of new visual and voice search and the acceleration of bot rather than mobile app interfaces. The challenges of fake news and knowledge as well as the interconnectedness offered by the adoption of internet of things are also recognised as strategic technology issues in the short term whilst Segars (2018) highlights the potential of new technologies to improve access to information (through powerful wireless mesh networks) to share information across devices (through pervasive computing) and to make sense of complexity (through machine learning and artificial intelligence). This potential for connectivity to enhance understanding will offer the potential to extend learning *'far beyond knowing facts or rote learning'.*

JISC (2022a) identify three key areas in which AI methods and tools are already beginning to make an impact:

- Chatbots and digital assistants
- Adaptive learning systems
- AI-assisted marking and feedback

Generative Language Models such as OpenAI's Chat-GPT 3 have raised concerns related to assessment security and academic integrity. Most of the debate has focused on assessment security and assessment design, including debate on whether the use of these tools constitutes cheating (Marche, 2022). However, the use of these tools does raise issues relating to academic integrity. As noted in a European Commission news article, "content created by ChatGPT is derived from content that has been previously generated by others and therefore it is not clear what are the implications in terms of copyright for reusing this content" ("Intellectual Property in ChatGPT", n.d.). Additional concerns have been raised on the accuracy and trustworthiness of the generated text (Caulfield, 2023; Wilkinson, 2023), both of which are important considerations if generative language models are to be used as learning tools ("Does ChatGPT mean the end of the essay as an assessment tool?", 2023).

1.2 The Changing Landscape

Aus Dem Moore et al (2016) describe disruption due to technology in learning as now '*pervasive'* and connect their predictions of the future to changes in both the demand and supply sides of Education. It is suggested that the rise of micro credentials will lead to the rise of *'modular learning pathways'*, that learning content will increasingly be *'unbundled'* due to increases in adoption of Open Educational Resources and crowdsourcing of content. The extension from unbundling to development of new pathways is also outlined by Reshef (2014) who suggests that effective digital solutions will start to offer *'equal or improved learning outcomes at much reduced cost'*.

The current scale of potential growth due to new educational technologies is highlighted by Navitas (2017) who clusters some 1500 companies into 26 groups and eight interconnected key themes where technologies offer potential for learning:

- **Create** – content and knowledge
- **Manage** – programmes, students
- **Discover** – enrolments, loans
- **Connect** – to learning, to people
- **Experience** – classroom technology, immersive technology (eg Virtual and Augmented reality)
- **Learn** – through open and proprietary courses
- **Credential** – through extension and expansion of existing approaches
- **Advance** – career planning and recruitment

A prime example is the emergence of commercial companies offering Massive Open Online Courses (MOOCs). In 2008, Stephen Downes and George Siemens created the first MOOC to exploit the interactive potential of internet tools to provide a collaborative, learner-driven learning environment. Open educational practice and collaborative learning were central features. Although only 25 students attended the course on the campus of the University of Manitoba, a further 2300 from around the world participated online. The potential for large scale global audiences was spotted by a number of entrepreneurs and there has been rapid growth in more conventional teacher-led and content-based MOOCs. By 2021 there were estimated to be 19,400 MOOCs offered worldwide to 220 million students, by over 950 universities (Shah, 2021).

Although developed by commercial enterprises, many of the major MOOC providers have roots in academic institutions including Harvard, Stanford and MIT, and as the popularity of MOOCs grew, many more universities entered into commercial partnerships with MOOC providers to co-develop and co-endorse courses.

As commercial MOOC providers and universities alike searched for ways to realise a return on their investments, the characteristics of MOOCs changed from the initial stand-alone, non-credit-bearing, non-assessed, free model that challenged traditional institutions, to something more like a traditional university course, with fees charged for optional assessments, course completion certificates and transferable credits. Major MOOC providers have offered accreditation through micro credentials, nanodegrees (Udacity), specialisation programmes (Coursera) or even academic credit transfers to shorten the time and cost of a

university degree (FutureLearn). At the same time some institutions have incorporated MOOCs into their degree programmes or co-developed with MOOC providers whole degree level courses and some MOOC providers have set up their own online degree courses (Johnson, 2018). By early 2022 Coursera offered a total of 38 Bachelor's, Master's and postgraduate degrees, according to its CEO Jeff Maggioncalda: "Students want the flexibility to learn online, and universities are responding by scaling online degree programs using partners like Coursera to meet demand" (SeekingAlpha, 2022)(Schwartz, 2022).

Such a diverse landscape demonstrates both the potential, the considerable scale and the challenge of the education technology sector. Given both the complexity of technology systems, the wealth of new technologies and potential opportunities now available to educators, there is a risk of what Schwartz (2006) calls a *'paradox of choice'* with too much choice, too little time and too little confidence to make an informed decision for many. Watson (2001) recognises the challenge of *'manging expectations of faster innovation'* and the *'customer expectation gap'* that may result when consumerisation of IT outpaces Institutional adoption and acknowledges that Institutions are likely to face ongoing challenges in both selecting and effectively implementing the right tools at the right time. Prior to the Covid-19 Pandemic, Deloitte (2017) contrasted recent rates of change in technology with the slower rates of change of individuals, businesses, societies and governments faced with accepting that technology. This model mirrors the challenge of new technologies taking time to be both accepted and adapted in the higher education sector.

It is known that, in the absence of major disruptions, the rate of adoption of technology can be complex and that common usage is likely to take time to reach widely acceptance (see, for example, Rogers, 1995 or Geroski, 2000). The technology acceptance model of Davis et al (1989) points to factors of *perceived usefulness* and *perceived ease of use* as key to user adoption of new technology whilst the Gartner Hype model and similar frameworks (Steinert, 2010) highlight the expected delay between technology emergence and established practice. Educators play a key role in technology evolution, and Kruger et al (2015) highlight the challenges of continuous technology evolution on adoption, causing educators to *'view new systems as potentially transient'* and making it *'understandable that they are resistant to invest the time into learning new systems'*.

Covid-19 changed that of course as the pandemic swept across the world in 2019 it excluded about 1.37 billion learners as well as about 60.2 million teachers from schools and classrooms (UNESCO, 2020). The impact of Covid-19 on education practice, systems and institutions is therefore hard to overestimate. During the pandemic, global registrations on MOOCs increased significantly (Education Technology, 2021). In early 2020, the pandemic prompted most teaching institutions around the world to move most, if not all, of their teaching and assessment activities online very quickly. A 2020 Jisc survey of UK higher education students revealed that 81% found themselves unexpectedly studying wholly online (JISC, 2021).

1.3 Technology Adoption

Abrahams (2010) highlights the need for a critical mass of faculty users to support diffusion and adoption of new technology within higher education institutions, whilst the critical role of networks – both political, social and inter-departmental- is highlighted by Mirriah et al (2012). Redecker and Punie (2017) suggest that the diversity of views toward technology result in different roles being adopted with learning technology in many institutions, from *newcomer* (to technology) through *explorer* to *expert* and *pioneer.* Jaschik and Lederman (2017) recognises the majority of faculty will use *'new technologies after seeing peers use them effectively*', a point reinforced by Kreijns et al (2013) who points to the powerful influence of peer usage and adds that increased adoption is also made easier by faculty with a blend of past experience and skills in use of digital learning tools.

In the run-up to 2020, technology implementation was becoming more a widely adopted practice rather than a clearly defined project. On-campus students have increasingly been able to watch recorded lectures from their study bedrooms, read course materials online, test themselves with online Self-Assessment Questions (SAQs), talk to their tutors and peers online, and download and submit assessments and receive feedback via the Learning Management System (LMS) / Virtual Learning Environment (VLE) (Maguire et al, 2020). But in most cases, technologies were used to supplement the on-campus learning experience, not replace it. The Great Leap Online of 2020-2021 showed how core teacher-learner and learner-learner transactions normally reserved for on-campus, in-person, learning can be managed remotely, online.

As the threat of pandemic-induced lockdowns receded, attention turned to what form the "new normal" post-pandemic learning landscape might look like.

"Those universities that fail to adapt and reimagine themselves as digital organisations may see their appeal diminish and their business come under pressure as students opt for models that suit their lifestyle and preferred way of learning. The signs are that universities are modernising and working hard to make the transition. Those that are bold and rethink their pedagogy, rather than replicate their traditional teaching patterns in the virtual world, can travel faster and, perhaps, further." (Maguire et al, 2020).

Immediately prior to the Covid-19 pandemic it was unclear which technologies would be adopted into mainstream practice in the short term, but distilling technology trends, (Brown *et al.*, 2015) provided a common view of the next generation digital learning environment by suggesting it would be characterised by

- **Integration** – although it may be based on an LMS or single system
- **Interoperability** – with adoption of open standards
- **Analytics** – to surface user needs and support options
- **Personalisation** – with the system neither the same for any individual or any institution
- **Collaboration** – as a 'lead design goal, not an afterthought'
- **Accessibility** – to ensure all learners and instructors are able to participate

Such traits reflect the more open architectures of today's learning providers and point to the flexibility and agility that can result from connecting systems together rather than seeking a single solution.

Distilling the challenge, Green (2017) suggested that the power rests with the educator,

'With so many technologies to choose from, practitioners must decide which of these are most effective to support their learning strategies.'

Covid-19 provided considerable focus, with most institutions rushing to implement a combination of online live (synchronous) events delivered via video conferencing platforms such as Zoom, online pre-recorded (asynchronous) videos and online (asynchronous) text material in the form of lecture notes, case studies, activities etc., plus asynchronous text-based communication via email, texts, WhatsApp messaging, Slack, etc. and a few simple interaction tools such as online polls and online collaboration spaces (JISC, 2022b). The apparent overarching aim in all this was to minimise risk by sticking to mature established technologies that were widely available, and which enabled teachers to transfer familiar teaching methods (lectures and seminars) to the online environment with minimal adaptation, or what Facer (2021: 10) terms *"a raft of post-COVID forms of technology-based reconfigurations of face-to-face schooling."*

With the exception of some areas of study such as Dentistry ("Blended learning and simulation", 2022), the short-term AR/VR applications and developments in AI supported teaching, learning and assessment were not a priority. In the longer term the imperative to find the most effective technologies is likely to result in renewed interest for institutions that have the time, expertise and resources to explore its many uses although adopting AI and other advanced technologies can be a daunting challenge for less well-endowed institutions (JISC, 2022a).

In conclusion, for technology and implications for learning, the following trends are emerging:

- Consumer based technology will continue to set high expectations for learning.
- Technology adoption within Educational Institutions was massively accelerated in response to Covid-19-induced restrictions on social contact but remains variable, with Institutions experimenting to balance expectations of innovation against investment and learning impact.
- More open learning technology ecosystems are likely to emerge to provide agility of adoption and flexibility of choice.
- Faculty exposure and groups will be key to encourage adoption.
- AI and other advanced technologies are likely to grow in importance.

2. Teaching tools and techniques – what are the challenges?

The classroom of the future – whether face to face, blended or online – is likely to be increasingly enhanced through technology. Graham et al (2013) recognise that technology is increasingly valued by adult learners both outside the classroom (for flipped classroom delivery, reinforcement, and collaboration) and within the synchronous classroom (to maximise engagement and learning).

Technology offers the promise of designing new experiences and opportunities for learning. Proserpio and Gioia (2007) highlight the potential to create connections between content, between people and between domains of knowledge when technology-based learning is effectively applied. Ubell (2017) points out that online environments open opportunities for reflection, anonymity (which can increase engagement) and analytics (to understand the effectiveness of learning).

Conrads et al (2017) suggest, that some educators fail to take advantage of technology in learning due to a *'lack of digital competences, and lack of their confidence in using digital technologies meaningfully in teaching'*. More typically, however, Jaschik and Lederman (2017) recognise that the majority of faculty teaching online have developed pedagogies and skills that have improved effectiveness of their teaching.

2.1 Tool selection and learning

Educators clearly must cut through the range of options in order to select what to use and how. Kirkwood and Price (2014) highlight that technology can be used to replicate, supplement or transform teaching practice; there is no one size fits all solution. Some educators are experimenting with new technology to assess potential for longer term benefit. Examples include:

- Development of more adaptive, more mobile, and more collaborative learning management systems (Brown et al, 2015)
- Use of VR and mixed reality both for simulation in high-risk environments such as health, offshore and aircraft (Velev and Zlateva, 2017) and to create powerful engagement and immersive experiences (Coppick, 2016)
- Use of mobile devices for immediate access to learning and to access complex content (Briz-Ponce et al, 2017)
- Gamification and game-based engines both to engage technology driven learners and to help develop learning pathways (Lavoué et al, 2018)
- The need to lead and manage virtual teams has led to improvements in virtual teaching practice (Caulat, G, 2012)
- Use of social tools for improved access to faculty such as Skype for coaching (Rock et al, 2013) and for language practice (Trejos et al, 2018)
- The combination of AI, Machine Learning and Robotics *'when properly used—to extend human capabilities and possibilities of teaching, learning, and research'* (Popenici and Kerr, 2017).

JISC (2009) stress the value of mapping learning goals through to appropriate technologies. The massive shift of lessons to Zoom calls during the Pandemic and subsequent student dissatisfaction with the quality of the learning experience (Pearson and Wonkhe, 2020) illustrates the risks of embracing new technology without fully connecting tools to learning goals.

The potential for more immersive technologies to create improved cognitive absorption and learner engagement has been highlighted by Chandra et al, 2009, who also point to the strong connection between ease of use and adoption of new tools. Kirkwood and Price (2014) point to positive student attitudes when adopting new technologies, but also highlight that new doesn't always translate to more effective learning. Luckin et al (2012) highlight the opportunity to make better use of tools available for many institutions rather than always looking to the new and novel; novelty does not always translate to pedagogy.

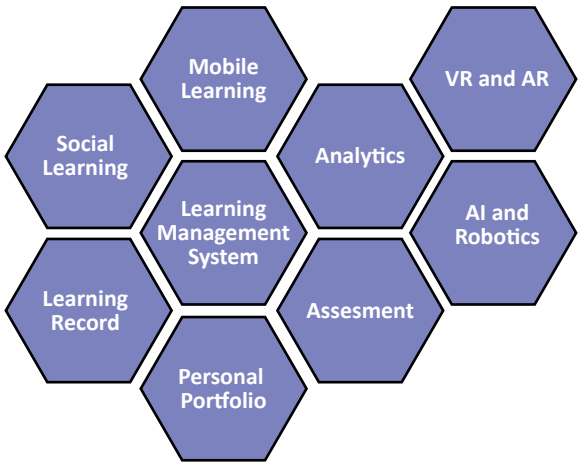
Pacansky-Brock (2017) highlights the value of contextualising technology into teaching (*why is it needed and how is it used?*) and of communicating expectations to students (*what are the norms, behaviours and desired outcomes?*). The lack of neutrality and implicit bias of technologies can also impact on the selection, application and acceptance of these tools by both faculty and students in a particular learning context ("What Is Technological Pedagogical Content Knowledge?", n.d.).

Ko et al (2017) recognises that student familiarity with tools and comfort with unfamiliar jargon used within online learning tools have the potential to be barriers to adoption and stresses the value of orientation sessions to ensure success. This engagement stage is seen as critical for both faculty and student to actively commit to engagement with online learning (Pacansy-Brook, 2017). Bolliger and Wassilik (2009) highlight that institutional as well as student engagement is required to create the appropriate learning environment; the complexity and demands of keeping pace with online raise concerns about *'faculty burnout'*.

2.1.1 Learning Management Systems

The critical components of a (fully) online course are identified by Simonson (2017) as '*content, design and instruction'* with technology – whether Virtual Learning Environment or more complex tool – recognised as just a tool for learning delivery. Whilst others argue that collaboration, reflection etc could now also be included as key components, the point remains valid; technology becomes irrelevant and invisible when strong learning is taking place. Against this goal, Kruger et al (2015) report low satisfaction rates with Learning Management Systems and point to many being *'cumbersome and unwieldy'*, causing more work for educators and little benefit to learners. The widely adopted VLEs and Learning Management Systems will, however, continue to contain considerable volumes of data and insight on student activities which, if analysed appropriately, have the potential to provide valuable insights on student pathways and hence improve learning effectiveness (Pardo and Kloos, 2011).

Many Learning Management System implementations have been built with a top-down as opposed to community-based model of learning (Makri et al, 2014) and there are views that the LMS has become outdated and more of a platform for record keeping rather than learning (Bersin 2018). A network of optimised and interconnected learning systems is widely felt to be the most likely future model to offer flexibility for institutions moving forward. It seems likely that the LMS as a discrete system will diffuse toward a more connected model of technologies embracing existing and new technologies as illustrated below.



Student dashboards empowered through technology will continue to be vital tools to guide students through networks of systems and improve motivation and retention as outlined in a study at Nottingham Trent where 27% of first year students changed behaviour just by being made aware of their performance data. (JISC 2017). Collaboration is also valued as a tool for engagement. In-class experiences are known to be enhanced through popular use of audience participations systems (Kaleta and Joosten, 2007) with increased adoption of personal devices rather than separate '*clickers*' seen as beneficial (Katz et al, 2017) although use of such devices for attendance monitoring seems to undermine student attitude toward their effectiveness. Such

techniques are also widely used in the online class to retain engagement and assess knowledge retention, with discussion threads, wikis, blogs and live classrooms some of many social technologies now being used to forge collaboration and support learning (Biasutti, 2017, Berry, 2017) as well as challenging learners to learn more deeply (Johnson, 2017). The engagement with such tools is connected to the effectiveness of online learning effectiveness (Wang, 2017) but the rise of informal networking sites and use of technologies outside the management of Institutions can create challenges of moderation, monitoring and data access and may warrant specific policies on the issue (see, for example, Hopkins et al, 2017).

Collaboration using discussion threads remains common, a range of technologies are being used to support collaboration and learning effectiveness across Institutions (UCISA, 2016) and live collaboration is increasingly popular through multiple formats, including growth of new forms of collaborative environment seeking to enrich experience through TV quality interaction with Faculty at Harvard and other Business Schools (HBX, 2018 and Wylie, 2017)

For synchronous classrooms, access to the internet during class is valued for knowledge access and real-world connectivity during learning (see, for example, Graham et al, 2013) but the use of devices in class has the potential to distract and effectiveness of digital tools may also vary by subject area. Carter et al (2017) highlight that deliberate use of digital devices may enhance performance but contrast this to cases where use is optional but unrestricted and where noticeably lower marks were obtained. Percival et al (2009) point to significantly different levels of effectiveness when contrasting students exploring engineering or education and suggest avoidance of Campus-wide policies on the issue.

Improved learning and collaboration technologies make large online synchronous courses now possible, but they create significant challenges of design, preparation, and learner engagement. The digital educator is increasingly part of a design and development team, embracing digital and instructional designers, media specialists as well as subject matter experts. The costs of digital development and content evolution are also significant; at the University of Texas Austin (Straumsheim, 2013) an introduction to psychology course with the potential to support online groups of up to 10,000 demanded a considerable support resource *'Between lecturers, audiovisual professionals, teacher's assistants, online mentors and programmers, the number of people associated with teaching one class has ballooned to more than 125'.*

2.1.2 Digital Distraction

The potential for technology to undermine learning effectiveness is highlighted by McCoy (2016) who found students spent over 20% of physical class time using devices for non-class purposes. Patterson and Patterson (2017) suggest laptop use in a physical classroom with peers being taught by the same teacher *'directly worsens academic outcomes for students who choose to use them'.* Mueller and Oppenheimer (2014) expressed concerns about shallow processing when using laptops in class, resulting in students *transcribing* rather than *processing* information appropriately to support learning. Spitzer (2014) points to negative impacts on memory from multitasking whilst using laptops in class and also highlights the significant impact of others in class, *'watching two other people multitask in front of you makes you lose 17% of the material presented in the lecture'.* Similar concerns arise with mobile phones, with just presence of the phone sufficient to reduce attention and cognitive processing (Ward et al, 2017). The challenge of learner attention and risks of distraction exist for the distance educator, but are even harder to observe and manage. Szpunar et al (2013) talk of the response to *'mind wandering'* as shorter lectures or interpolated testing but stress that pedagogy and continuous attention to learner engagement are critical broader solutions.

The flipped classroom (in particular, using video) is increasingly being adopted both to prepare for more collaborative classroom activities and to prime for investigation of complex themes (see, for example, Dix, 2017). There are many positives and opportunities to use flipped classrooms to engage with large class sizes, enrich learning and set challenges to bring to class (see, for example, Ojalvo and Doyne, 2011). Challenges of adoption and optimisation of the flipped classroom are, however, highlighted by McNally et al (2017) who distinguish those individuals that embrace and indeed prefer the flipped classroom approach (the '*endorsers*') from a group that are largely neutral but chose not to pre-learn (the '*resistors*'). These concerns are echoed by Blair et al (2016) who highlight the value of attendance and commitment in both traditional as well as online (flipped) classes as key to achieve success.

2.2 Covid-19

The switch to emergency remote teaching during the COVID-19 pandemic has forced HEIs to undergo rapid transitions, resulting in faculty members transforming their teaching practices, students adapting to new forms of learning, and universities advancing their organizational and infrastructural capabilities. The prolonged closure of higher education institutions and the sudden prioritization of online learning has brought about new challenges for academics, including a need to develop new skills while working in difficult conditions. Studies (Flaherty, 2020) have shown that the COVID-19 pandemic has had a significant impact on the mental health of faculty members. Results showed that what started as concerns about the pandemic has evolved into chronic stress. 40% percent of survey respondents considered leaving their jobs due to the pandemic's impact. While blended learning and hybrid instruction have moved up the ranks among the suite of Professional Development offerings, there are calls to addressing the mental health challenges faced by faculty members and providing support in managing work-life balance (Baker & Lutz, 2021).

It is a mixed picture. According to the Jisc 2020/21 Staff digital experience survey, HE staff reported a wide range of positive effects of the shift to online teaching. Respondents felt that they were able to respond more quickly to students, and that there were more ways to engage with them and stay in touch using chat forums and video calls. They also reported an improved work-life balance because they weren't spending time commuting and there were fewer distractions working from home. Some reported increased student engagement online and improved access to learning and to resources, compared with on campus, and they observed that the flexibility for learners to participate at a time and in a way that suited them made a positive difference (JISC, 2021).

In a survey of US and Canadian institutions, nearly half of respondents said they lowered their expectations for the amount of work students would be able to do (48 percent), made it easier for students to achieve a pass on their courses (47 percent), and dropped some of the assignments or exams (46 percent) (Lederman, 2020). Again, not surprisingly, reactions to the wholesale transfer into distance learning were mixed. Many of the US and Canadian survey respondents expressed anxiety about the rush to remote learning. In the UK, the Guardian newspaper reported on the unpreparedness of many UK universities for this sudden and massive shift (Batty and Hall, 2020a). A 2020 Pearson/Wonkhe survey of higher education undergraduate and postgraduate students in England and Wales during lockdown revealed that only around two thirds of respondents found their online teaching intellectually stimulating; slightly more than half felt that they had had sufficient teaching and learning to adequately prepare for course assessments; and only one third said they had regular indicators about how they were performing on the course (Pearson and Wonkhe, 2020). On the other hand, in the UK at least 68% of students rated the quality of online digital learning on their course as 'best imaginable', 'excellent' or 'good' and 62% of them also rated the support they received for online learning equally highly, according to the Jisc 2020 survey of student digital experiences (JISC, 2021).

2.2.1 Blended Learning Review

In March 2022 as a response to some student experiences during the Covid-19 pandemic, the Office for Students launched a Blended Learning Review where Blended Learning was defined as teaching and learning that combines in-person and digital delivery (Office for Students, 2022a).

The resulting panel report identified numerous issues and approaches that they considered important for the design and delivery high quality academic experiences involving blended learning approaches. Key findings from the report were:

- There are examples of high-quality blended approaches and innovation that support students' learning.
- There are pockets of poor online teaching practice and poor online learning resources.
- The balance between face-to-face and online delivery is not the key determinant of teaching quality.
- Students reported that they received less timely and lower quality feedback in online learning settings than in face-to-face settings.

- Students reported feeling isolated studying online during national lockdowns and they identified a negative impact on their sense of belonging to an academic community because of an absence of peer networks and support during periods of isolation.

The panel recommended that:

- Students must have clear information about the approach they can expect to blended learning when they are thinking about applying for a course and after they have registered.
- Unedited lectures from previous years should be carefully reviewed before they are used again, to ensure all course information is accurate and course content is up to date.
- Growth in student numbers does not drive their approach to blended learning and, instead, the blended approach should be informed by sound pedagogic principles.
- Approaches to learning and teaching should allow academics to identify where students are struggling with online content or falling behind, so that their learning needs can be addressed.
- They engage with students to identify and address barriers to attendance and engagement.
- They work with students and students' unions to create tools (including surveys, focus groups, reference groups) for students to evaluate their experience of blended study.

In their response to the report, the Office for Students identified additional considerations for institutions, with the focus on compliance with regulatory requirements. Providers were asked to consider whether:

- Online lectures are up-to-date and of good quality.
- Online feedback is timely and of the same high quality as students would expect when learning in-person.
- Decisions about the balance between online and in-person learning are underpinned by sound pedagogic reasoning, not a desire to accommodate increased student numbers or to compensate for limitations in the physical space needed for in-person teaching.
- Students receive clear detailed information about how their course will be delivered.
- Students and staff are supported to develop the skills they need to engage effectively in online learning.(Office for Students, 2022b)the Office for Students (OfS.

2.3 Looking forward

The UNESCO report AI and education: Guidance for policy makers ("AI and education: guidance for policy-makers- UNESCO Digital Library", 2021) identifies three main areas where AI can be utilised to enhance education, these are:

- Education management and delivery,
- Learning and assessment,
- and Empower teachers and enhance teaching.

The report notes that in comparison to student facing systems, there has been limited focus on teacher facing systems that augment and enhance teachers and teaching. Luckin (cited in Times Higher Education, 2016) suggests the potential of AI to address fundamentals to create the opportunity for *'teachers to do the more complicated teaching'*. The changing role of the teacher in the classroom in currently unclear. In their review of Selwyn's Should Robots Replace Teachers?, David Longman states that "Teachers need to work together with machines "on their own terms" to improve the quality of education. Above all, for this partnership to work, educators must ensure that they have a clear and articulate voice that guides the changing technological landscape of professional practice."("Should Robots Replace Teachers?", 2019)

Paul Feldman predicts that AI can both relieve administrative burden from faculty and potentially change research as much as teaching due to accelerated information processing techniques (cited in Niven, 2018). However, it has been shown that the removal of one burden can result in the introduction of others (Facer and Selwyn, 2021)

Susskind (2017) connects AI to potential disruption in the legal sector, enabling automation, connectivity and on-demand access to knowledge. The automation of more mechanistic aspects of the law will create demands on the lawyers of tomorrow to remain adaptable and actively maintain knowledge. E-learning approaches will also have to evolve from a focus of delivering knowledge to one that actively engages learners in valuable skills such as advocacy, client management, due diligence, and negotiations.

The arrival of generative AI tool, ChatGPT-3, in November 2022 has resulted in mixed responses in the higher education community. Questions have been raised about the appropriateness of setting assessment questions for learners that can be answered by ChatGPT-3 with papers of reasonable writing quality in mere seconds.

While AI has the potential for addressing issues in traditional assessment (Swiecki et al., 2023), it has also been noted that AI scales and magnifies biased practices, including undesirable pedagogical practices. Vendors who develop AI products to solve existing educational problems may exacerbate underlying problematic practices, such as reinforcing artifacts of learning and behaviorist approaches instead of the process of learning and constructivist approaches. Therefore, it is important to consider the potential ethical implications of AI in education.

The use of AI in education should be guided by principles of transparency, accountability, and human-centered design, with a focus on fostering equitable and inclusive learning environments (Tuomi, 2018). In order to answer the question raised by Gasevic and colleagues (2023) “what will we teach and how will we teach when artificial agents, now readily present in our daily lives, exceed our cognitive capacity in a growing number of domains?”, Professional Development efforts must continue to evolve in supporting institutional framing of pedagogical application of AI, developing AI literacy (Laupichler et al., 2022) and facilitating a participatory educational design approach for learning in the AI world (Carvalho et al.,2023).

In conclusion, for teaching tools and techniques, the following trends are emerging:

- Educators are somewhat overwhelmed and need to be better supported in their use of digital technologies. This particularly evident in the wake of the Covid-19 Pandemic.
- Experimentation is likely to continue and knowledge sharing of what works would be useful for educators.
- Structured LMS’s are likely to become more open to support a learning ‘ecosystem’.
- The selection and use of teaching tools will increasingly be for learning effectiveness rather than ‘newness’ – pedagogy will be more important than novelty.
- Whilst digital technology is evolving, it is less clear how quickly digital learning is evolving in practice.
- A.I. technologies are disrupting assessment practices and approaches.

3. Learner preferences and practices – what do learners need?

3.1 Students as Consumers

The role of students as consumers is identified by the Office for Students, and as a condition of registration institutions are required to give due regard to the compliance with consumer law. In addition, under the Rules of the Office of the Independent Adjudicator current and former students complain about anything their higher education provider has done or failed to do ("Who can complain?", 2018). The increasing importance of student satisfaction is underlined by its inclusion in the National Student Survey, and is considered a primary factor alongside loyalty (incorporating retention and recommendation) as a measure of value of the university experience (Woodall *et al.*, 2014).

With increased student instrumentalism and the move away from students as agents in pedagogic process, to purchasers of learning there has been a shift from the perception of Higher Education as being a public good, to one that primarily serves private interests and values (Tomlinson, 2017).

3.2 The Digital Learner

Given the changing nature of the learner in a digital world, it is important to consider whether learning habits, practices and effectiveness were already evolving prior to Covid-19.

The challenges of teaching a generation of learners who have *'grown up with Google'* is well documented, creating a challenge of engagement to educators seeking to teach learners with strong digital literacy and with preferences for *experiential learning*, *interactivity*, and *immediacy* (Skiba et al, 2006). Millennials are recognised as *'adaptable'* but some (such as Arum and Roksa, 2011) question both the quality of student reasoning that is developing in a digital world and the quality of evidence evaluation that is applied (McGrew et al, 2018). Jaschik and Lederman (2017) echo the point, identifying emerging concerns at lack of understanding of plagiarism in undergraduate students. Selwyn (2003) recognises the initial contrast between 'fixed' teaching institutions and the emerging always-on culture of *'connectedness'* of mobile learner access. This trend presents a challenge to the alignment of educator preference and learner need in terms of technology. There are contrasting views as to whether institutions or learners should change, with some students suggesting teaching practices are *'from the last century'* (Blumenstyk, G, 2017). Proserpio and Gioia (2007) talk of the need to address this by aligning *'teaching and learning styles'* to optimise both learning impact and student performance.

The rise in smartphone use provides an opportunity for the digital educator to exploit positive opportunities for continuous connection to information and continuous connectedness between participants. In 2021-22 93% of students used a laptop to support their learning and 63% used a smartphone (JISC 2022b)

But such benefits also have an unknown psychological cost (Pearson and Hussain, 2017). There is a fine line between increased smartphone and internet use and addiction (Lopez-Fernandez et al, 2014) and some evidence that increased technology use is starting to change the way young learners think (Taylor 2012). There is some evidence (Carr, 2010) that widespread adoption of devices is fundamentally changing the way we think, remember and therefore learn. Others highlight that, after an event, there is growing evidence that learners are able to recall *where* to access information but not necessarily the information itself (Sparrow et al, 2011). The suggestion is that, to some extent, parts of memory are being outsourced.

'The Internet has become a primary form of external or transactive memory, where information is stored collectively outside ourselves'.

Spitzer (2014) suggests that, as a result, the reduced cognitive load when using technology could lead to reduced ability of learners to build appropriate connections between concepts.

There is some evidence that consumer experiences are resulting in learners becoming more impatient and more demanding of technology with greater expectations of delivery, despite the reality of Institutional anchors and procedures inhibiting rate of adoption. Dzuiban et al (2013) highlight the challenge of responding to the ever-changing nature of student expectations and *'voice'* in higher education, suggesting

that established assessment methods will be increasingly challenged by evolving student perceptions of learning experience. Newman and Beetham (2017) suggest that students are generally positive about learning technology experiences, but they expect Institutions to continuously improve technologies and address the quality of learning experience.

UK student responses to the sudden shift to online teaching reflect this positive outlook At the height of the pandemic "68% of students rated the quality of online digital learning on their course as 'best imaginable', 'excellent' or 'good' and 62% of them also rated the support they received for online learning equally highly" (JISC 2020). Almost two years on from the pandemic, the JISC Student digital experience insights survey 2021/22 shows student support for a combination of online and face-to-face learning. When asked how they would like to be taught, 42% said mainly on site, 45% preferred a mix of on-site and online and 13% wanted to be taught mainly online (JISC, 2022b).

Brooks et al (2016) recommend ensuring online learning interventions are appropriately incentivised and embedded in wider learning activities. This connection is particularly important to avoid learners seeking to *game* the system if confident, resulting in *'superficial as opposed to deep learning, if any learning at all'.* For learners, both perceived usefulness and perceived ease of use are essential to facilitating adoption and acceptance of new technology (Davis, 1989). Agarwal et al (2000) highlight that user belief in the effectiveness of a system is a key factor in encouraging adoption, whilst from an Institutional perspective, Luckin et al (2012) point to cost, complexity and (online) safety of technologies as potential barriers to adoption.

Once using technology for learning, the effective learner use of knowledge sources, management of fake news and acceptance of facts presented may also be an issue for tomorrow's digital educator. Back et al (2016) found that students valued learning management systems to access curricular content and timetables but open sources including Wikipedia were popular as a source of knowledge acquisition. Rodgers (2018) highlights the emerging tension between established and emerging information literacy practices in a digital world and recognises the challenges presented by socially curated or rapidly generated computer-based information that appears credible to students. Wisely, the suggestion is to

'prefer primary sources, seek multiple sources, look past advocacy, question motives for reporting, and look for reasons why disagreements may exist among diverse sources.'

To complicate matters, the learner population is increasingly diverse, made up of what Howe and Strauss (2007) call *'a generational constellation'*, creating a variety of teaching and learning preferences both within learner groups and between educator and the student population. This also creates a challenge to digital design in seeking to find the dominant preference of a given learner group. Karakas et al (2015) suggest such difficulties may be managed through learning design and selection of appropriate tools and techniques, with the digital educator addressing lack of concentration through use of reflective spaces, lack of engagement through creative spaces and lack of socialisation through collaborative spaces.

The inconsistency of Digital skills across the learner population is a potential challenge to engagement with new digital learning technologies. Kluzer and Priego (2018) estimate that 44% of the EU population have insufficient digital skills, and map out 21 competences necessary to be digitally competent (mapped to 8 proficiency levels). Both JISC (2017) and Redecker et al (2017) have distilled digital competencies into specific digital competencies for Educators, which will be reviewed later. Digital literacy is seen by Sohelia and Singh (2015) as a key factor in reducing barriers to learning technology adoption, and several Institutions (see, for example, JISC, 2014, Sheppard and Nephin, 2014) have developed digital literacy tools and guidance to enhance digital skills and competencies of faculty. Sharpe and Beetham's pyramid model of digital literacy (2010) identifies levels of literacy from digital access (still a problem in many parts of the world) through skills to effective digital practice and identity and JISC (2014) provide seven elements of digital literacy:

- **Learning skills** – ability to both study and learn in formal and informal digital environments
- **Digital scholarship** – ability to participate in practices (academic / professional / research) that relies on digital
- **Information literacy** – effective information access, evaluation, management and sharing practices

- **Media literacy** – ability to engage with content in multiple formats
- **Communications and collaboration** – ability to participate in digital networks
- **Career and identity management** – ability to manage reputation and identity online
- **ICT literacy** – ability to use and adapt systems and services to needs

For students, Woods and Oradini (2013) suggest the vast majority of students consider themselves digitally literate but recognise the importance of embedding digital skills development into the curriculum to aid employability. French (2014) recognises the value of basic IT skills – Excel, Email, Social Media – being *'as much a key functional skill as numeracy and literacy'* but bemoans that *'too many young people leave education without the basic digital skills'.* Rowlands et al (2008) stress the risks of assuming the Google generation will have acquired appropriate digital learning skills; books are still valued but habits of plagiarism, poor information search techniques and reduced library usage were recognised as challenges to future educators. Schech et al (2017) recognise the ability to work (digitally) in a digital world as an important enabler of *'getting work done'* and also highlight the opportunity to use digital collaboration tools whilst learning to build appropriate life skills for employment. For digital educators, the implication is that understanding effective use and appropriate behaviours with digital tools is becoming a key skill in the digital world.

The variation in use of technology – both within a group and across the globe – creates a considerable challenge to aligning solutions with needs for the digital educator. Although in some studies (see, for example Li et al, 2018) the learning styles of students are felt to be significant in learning effectiveness, Husmann et al (2018) and many others disagree with their use in education with little evidence that studying according to supposed preferred learning style leads to better outcomes. Learning styles have been used as a frame for structuring learning design in some cases as illustrated by Wessel et al (1999) but Willingham et al (2015) highlight the lack of success in finding an agreed model to characterise student learning preferences. The value of considering both difference and common ground in students is likely to endure in considering the future of learning, with the need to connect any preferred style to digital learning preference and competence complicating the analysis still further. Course design is key with Johnson et al (2017) suggesting the planning of

'experiences that cultivate a genuine curiosity in students so they are excited to explore subjects further'.

The rise of data analytics and resultant personalisation technologies offers promise to provide a strong bridge between learner needs and educators (Bienkowsk et al, 2012) with profiling as an important first step toward adaptivity (albeit with parallel privacy and data protection issues). To support personalisation of learning, Drysdale (2013) points to increasing research focus on student outcomes, highlighting the need to address both student engagement and motivation when carrying out learning design, whilst Boelens et al (2017) suggest attention is needed in fostering an affective learning climate that builds student confidence, engagement, and outcomes. Recent years have also seen an increasing emphasis on student wellbeing and mental health. In response to an Office for Students Challenge Competition, the University of Derby, King's College London, Aston University, Student Minds and Advance HE developed the Education for Mental Health Toolkit which launched in early 2022 ("Education for Mental Health Toolkit | Advance HE", n.d.).

The digital educator will, however, need to preserve the distinction between personalisation and ease of learning; to avoid the '*illusion of knowing'*, Brown et al (2014) point to the value of enhancing assessment and feedback through frequent low stakes testing to help embed knowledge and skills. Brown et al also stress that deeper and longer lasting learning is stimulated when effort is required, so they highlight the need both to design in '*desirable difficulties*' and to connect concepts to a range of contexts in order to embed learning.

Such techniques demand continuous and effective feedback techniques, and JISC (2015) highlight exploration of new approaches to provide both feedback and feed-forward (constructive guidance on how to improve). Audio and video feedback are recognised as providing a more engaging and valued form of feedback. Smith et al (2017) also stress the importance of connecting appropriate assessment techniques with effective feedback, highlighting the use of technologies such as screencasting to provide richer form of feedback on summative assessment as it '*offers the opportunity for richer, more dialogue-driven comment'.* They also

highlight the value of e-portfolios to provide greater visibility of student progress, a point reinforced by Karakas et al (2015) who highlight the value of a reflective portfolio to seed longer term learning.

3.3 Conclusions

In conclusion, for learner preferences and habits, the following trends are emerging:

- Learner habits are evolving rapidly, creating an increasing challenge to educators of 'understanding the modern learner' and of keeping up with learner expectations.
- The value of testing, data analytics and learning pathways are likely to increase to support enhanced engagement and learning.
- The importance of digital literacy is likely to see demands for enhanced digital skills development in higher education from both learner and potential employer.

4. Higher Education Sector Trends – What is changing?

The role, purpose and autonomy of Higher Education providers has been a source of debate in recent years with the introduction of the Office for Students, the employability agenda and the Higher Education (Freedom of Speech) Bill. There has also been fierce criticism from the media on perceived "woke agendas"(Stringer, 2023) and lack of value for money (Schiavone, 2022).

4.1 Employability

Employability can be defined as "*how higher education develops critical, reflective, empowered learners*" (Harvey, 1999a, p. 13). Harvey goes on to state that "*employability is not about getting graduates into jobs. It is not even about delivering "employability skills" in some generic sense. Rather it is about developing critical lifelong learners—and employability is subsumed as a subset within that. So the focus needs to be on empowering students to become critical learners..*" But also, "*employability is not about getting graduates into jobs. It is not even about delivering "employability skills" in some generic sense. Rather it is about developing critical lifelong learners—and employability is subsumed as a subset within that. So the focus needs to be on empowering students to become critical learners.*". However, UK Higher Education institutions are measured against the employment rate of their graduates.

The OECD reported in 2017 that for countries to improve economic and social outcomes through participation in global markets *"all industries need workers who have not only strong cognitive skills (including literacy, numeracy and problem solving) but also managing and communicating skills, and readiness to learn"* and for graduates to be equipped with reliable qualifications and strong mixes of relevant skills ("OECD Skills Outlook 2017 (Summary in English)", n.d.).

4.2 Technology adoption

For all the promises of learning technology, prior to 2020 the rate of adoption in higher education was slower than many would have expected. Kirkwood and Price (2014) suggested that to date:

'The potential of technology to transform teaching and learning practices does not appear to have achieved substantial uptake, as the majority of studies focused on reproducing or reinforcing existing practices.'

Notwithstanding this, educational technology developments were and are regarded as important by institutional leaders. Jaschik et al's (2018) survey of provosts and chief academic officers suggested 8 in 10 were expecting to expand online offerings over the next year, while more recently the Chair of the UK Office for Students suggested "Universities and colleges will not be able to make the necessary shift from the present to the future without taking a whole-institution, strategic approach. If, as seems likely, the future will involve both face-to-face and digital teaching and learning as well as approaches which blend the two, then the effects on the institution will be profound. .....All this means vice-chancellors, leadership teams and governing councils need to be at the forefront of thinking through what the digital revolution means and then act accordingly" (Barber, 2020).

Quite how institutions will decide to do this is a far more complex matter. Strategies are unlikely to be the same everywhere or even stay the same in any given place as institutions flex to meet changing circumstances. The new normal is likely to be a blend of online and face-to-face, with the added complication of having to manage both modes simultaneously at least some of the time: so-called 'hybrid' learning, where part of a class may be studying online while the remainder are physically present in class. The tutor(s) of course may be present either way.

Digital transformation of higher education is broader than the delivery mode as highlighted in the recently published, March 2023, Jisc *Framework for digital transformation in higher education*. It incorporates "digital leadership, appropriate investment, robust secure infrastructure, stakeholder engagement, and digitally capable staff and students." ("Framework for digital transformation in higher education", 2023) and is a complex organisational change challenge.

4.3 The role of MOOCs

As we saw in section 1 'Technology Trends and Implications', MOOC partnerships and investments continue to grow, with Business and Management and Computer Science subjects leading the way by volume (The Economist, 2017). The rise of the MOOC creates both opportunity and threat, fee and free channels, but has both allowed more faculty to voluntarily engage with online learning and provide access to quality learning in an age of overload. Headlines on the perceived high dropout rate of MOOCs overlook the voluntary and low stakes nature of engagement as well as those browsing MOOCs for knowledge on subjects of transient interest (Liyanagunawardena et al, 2014). Learners may well not be interested in a full course and there is evidence that a large group use MOOCs as a resource for reference – a form of digital textbook. Parkinson and Chew (2016) recognise that the brand association with major academic Institutions creates a badge of quality:

'Content becomes readily available to students much in the same way Google and Wikipedia provides, yet with the branded goods providing some reassurance of their quality and reliability'

Siemens (2015) points out MOOCs are a potential stepping stone to other courses in the higher education sector and that they also help institutions to evolve new practices as they open the door to *'new ways of thinking and operationalizing innovations in education'.* Howarth et al (2016) also point to the potential value of MOOCs as a marketing technique, providing a *'taster'* for more detailed study. This progression is not assured given the widely recognised *'funnel effect'* in low fee or free MOOCs with a large drop in numbers from registration to completion (Clow, 2013). Steffens (2015) is less convinced of the learning impact of MOOCs, observing that *'MOOCs have spread at a breath-taking pace in the last few years, although it is far from clear to what extent they are based on principles from learning theories and really support learning'.* The different pedagogical approaches that may be required for 'at scale' as opposed to 'on campus' courses could lead to differing participant experiences (Stacey 2013). Howarth et al (2016) suggest such differences may limit the effectiveness of MOOCs for marketing purposes moving forward.

Hollands and Tirthali (2014) highlight that many initial MOOCs fell short of expectations. In particular:

- Increasing access to education – many MOOC participants are already well educated, and a relatively small percentage engaged fully with the course.
- Building and maintaining brand – isolating and measuring impact is challenging.
- Reducing costs or increasing revenues – many early-stage MOOCs required considerable investments in time and money.

They also observed the value in MOOCs allowing institutions to experiment:

'with various types of blended or hybrid delivery models on-campus, and in efforts to help struggling students find low-risk options to build skills that allow them to test out of developmental education courses'

MOOCs have continued to evolve and are now a key part of the digital education space. Shah (January 2018) highlighted the scale of the MOOC space in 2017:

- Over 81m learners
- Over 800 University partners
- 9400 courses
- Over 500 MOOC based credentials – from nanodegrees, microdegrees, micromasters to professional certificates and specialisations

As we have seen, by 2021 these estimates increased to 19,400 MOOCs offered worldwide to 220 million students, by over 950 universities, excluding China (Shah, 2021). Chinese MOOC platforms surged in both course numbers and enrolments due to the 2020 pandemic. In early 2022, 24 Chinese MOOC platforms offered over 69,000 MOOCs in Chinese, around twice as many as in 2020 (Ma, 2022).

Kim (2017) recognises that, whilst the educator / learner relationship is hard to scale, good MOOCs have now matured beyond just content delivery to create both learning communities and a more reliable

pathway toward more traditional credentialing opportunities. MOOCs are increasingly accepted as a space to experiment, market and commercialise and Howarth et al (2017) suggest that the likelihood of MOOC participants transitioning to further enrolment is enhanced when they have both been satisfied with the MOOC experience yet feel that the final award falls short of their educational ambitions.

The companies associated with MOOCs continue to grow and evolve. Shah (April, 2018) suggests that increasing success has allowed MOOC providers to move upstream toward corporate learning and online degrees. In parallel, partnerships have been established (Coursera now have over 1000 corporate partners) and revenues have started to grow significantly. Udacity exceeded $70m in 2017 up from $25m in 2016 while Coursera's revenue grew to $415.3 million in 2021, a 41% increase from the year before. With such investments and accelerating power, their influence and impact on the future of online education may become increasingly significant, although revenue does not tell the full story. Coursera's net losses more than doubled to $145.2 million in 2021 as the company increased spending on research and development as well as sales and marketing. (Schwartz, 2022)

Major MOOC providers have offered accreditation through microcredentials, nanodegrees (Udacity), specialisation programmes (Coursera) or even academic credit transfers to shorten the time and cost of a university degree (FutureLearn). At the same time some institutions have incorporated MOOCs into their degree programmes or co-developed with MOOC providers whole degree level courses, and some MOOC providers have set up their own online degree courses (Johnson, 2018). By early 2022 Coursera offered a total of 38 bachelor's, master's and postgraduate degrees, according to its CEO Jeff Maggioncalda: "Students want the flexibility to learn online, and universities are responding by scaling online degree programs using partners like Coursera to meet demand" (Schwartz, 2022).

When MOOCs are used for certificates of completion or other awards, the wider issue of credentialing needs to connect to issues of industry and academic relevance and recognition. Increasingly employers are placing a premium on skills and competencies and have a corresponding interest in the assessment and validation of competency-based skills that enable workers to demonstrate what they can do with knowledge at specific levels of competency and skill grades (McGreal et al. , 2022). Equally, from the perspective of employees

'people are much more likely to invest in training if it confers a qualification that others will recognise'. (The Economist, 2017)

The use of open digital badges for positive reinforcement of learning accelerated after 2011 when Mozilla, with funding from the MacArthur Foundation, developed a way to recognise learning '*wherever it was happening*' (Mozilla, 2017).

However, while the provision of MOOCs and other forms of open digital learning on the Internet is expanding, there has been a lag in corresponding systems for assessment and recognition of this growing international form of non-formal networked learning (McGreal et al. , 2022), prompting calls for an international scalable credit recognition system based on "nano-credentials" World Economic Forum (2021).

The value of any new form of credential needs to move beyond practicality to widespread acceptance, understanding and use of appropriate standards (Carey and Stefaniak, 2018). The issue of quality and trust is significant (Finkelstein et al, 2013) whilst the interface between less formal forms of credential and higher education credit remains challenging. Buban (2017) suggests

'Challenges remain for students who seek to bring alternative forms of learning to their higher education experience.

'Constructing a degree with a combination of transfer credit, prior learning, and other types of courses……is something of a puzzle'

There is some evidence of polarisation between skills based '*badges*' and more academic '*credit*', but only limited evidence as yet that employers are as yet showing any significant signs of favouring the former for anything beyond basic skills and competencies. Mischewski (2017), however, suggests that the development of new forms of credential and their connection to more flexible learning paths could create opportunities to open up learning to new groups to address skills shortages in some areas.

Responding to this challenge many HEIs are now actively engaged in granting and/or recognising micro-credentials. Four out of five institutions report some deployment of micro-credentials and roughly half of institutions have a micro-credential policy in place (McGreal et al. , 2022).

The emergence of Blockchain technology offers scope for improved costs of data management as well as to develop new models of trusted exchange between employer, student and academic institution (Grech and Camilleri, 2017). MIT have recognised the potential of the Blockchain to create a secure digital route to access certificates and other credentials that could be both trusted by institutions but with records carefully owned, curated and shared by individuals. Their response has been to create an open framework based around the concept of 'Blockcerts' as a means of receiving and sharing appropriately validated records (Schmidt, 2015). In the UK, Wolff university claimed to be creating the world's first Blockchain university, using the technology both as a secure means of academic record and to facilitate high quality interactions between student and teacher based around the tutorial system. Beyond this, personal portable learning portfolios and credit records maintained independently by the learners themselves via third party providers based on Blockchain technology are being explored by a raft of interested parties (Ark, 2020).

As online continues to scale, the assessment of quality in digital teaching and learning will become more important evolving those benchmarking and assessment frameworks that already exist (see, for example, the EFMD EOCCS model or SLOAN C (now OLC) pillars as outlined in Moore, J, 2005). Adoption and wider exploration of such benchmarking frameworks is likely to intensify as institutions look to optimise and continuously improve their use of digital learning.

4.4 Conclusion

In conclusion, for Higher Education trends

- MOOC providers are likely to continue to be catalysts for ongoing innovation and change
- Degree partnerships and new forms of credential are likely to continue to evolve to provide flexibility for tomorrow's learner, including personal portable learning portfolios and credit records maintained independently by the learners themselves via third party providers
- Qualification standards and credit frameworks are likely to be increasingly important issues

5. Wider Learning Industry Trends

Higher education Institutions exist in an increasingly complex global environment, with new players and practices emerging rapidly. There is increasing recognition that the companies of tomorrow will demand new skills and new roles in response to accelerating change. The World Economic Forum (2017) point out that:

35% of the skills demanded for jobs across industries will change by 2020, at least 1 in 4 workers in OECD countries is already reporting a skills mismatch with regards to the skills demanded by their current jobs

Rahschutlte (2018) points out that knowledge shelf life is limited and that the rapid evolution of knowledge signals a need for situational analysis, rapid but effective decision making and, most critically, continuous learning. Arbesman (2012) highlights that whilst some principles of knowledge remain static, others will change often, creating risks for those seeking to make decisions based on outdated information. The consequence of rapid knowledge growth, obsolescence and Industry change is discussed by Saracco (2016) who questions the very concept of a 'job' (let alone a job for life) due to the rapid evolution of work.

The accelerating development of new (often interdisciplinary) knowledge combined with the rapid obsolescence of existing knowledge creates a strong driver for new models of lifelong learning. It has long been recognised that professionals risk knowledge obsolescence due to a combination of accelerating growth of new knowledge and the *'potential deterioration of previously held expertise'* (Rothman and Perrucci 1971).

Lifelong learning is also increasingly important due to our longer lifetimes. If, as Gratton and Scott (2017) and Van Dongen et al (2018) suggest, one consequence of people starting to live longer is likely to be longer working lives which may be expected to go through more varied and complex stages. Individuals will need to prepare and cope with transitions and learning needs will need to adapt and flex to support these demands, addressing the needs of new generations of learners and encouraging collaboration and knowledge transfer. As Van Dongen suggests,

'those charged with organizational development will need to take a close look at how individuals learn at different stages of their life and design their development programs accordingly'

Skiba (2017) notes the difficulties for digital educators are twofold:

'As faculty, we are constantly updating courses, trying to stay one step ahead of our students'

In addition, however, 'we are expected to manage knowledge related to teaching-learning, educational technologies, and devices that are accelerating at warp speed'.

Towards Maturity (2018) recognise that digital learning adoption in the corporate space is being held back due to a lack of awareness as to what technology can bring to the learning agenda, but point to a six-point plan for success in practice:

- Define needs
- Understand learners
- Connect to context
- Build capability
- Ensure engagement
- Demonstrate value

Given the need to continuously refresh knowledge in the corporate environment, Bersin (2018) talks about the need to learn *in the flow of work* and similarly, Karakas et al (2015) recognise that *'learning is not confined to the spatial and temporal boundaries of the classroom in the digital age' and talk of the need to create 'learning at the speed of life'.*

Learners in the rapidly moving world are challenged, overwhelmed and yet demanding and impatient in their demands for untethered on-demand learning (Tauber and Wang, 2014). It is important to respond to this

need with a blend of access and challenge, as Spitzer (2014) suggests, *'The more effort you have to take, the better the learning outcome'.*

The corporate learning industry is largely ignoring this trend, instead focusing on the attractive promise of nanolearning, learning at point of need and microlearning (Eades, 2014). From a digital educator perspective, such approaches may create a tension between the ease of learning the basics in the shallows as opposed to the professional need to understand more complex or multidisciplinary issues at depth. Spitzer (2016) questions the value and impact of knowledge on demand whilst Carr (2010) warns of the need to avoid and challenge shallow learning, and yet adoption of skills based platforms is widespread with the likes of Udemy, Linkedin and Coursera leading the way (Chen 2018) and corporates such as IBM have tried to connect smaller learning experiences into badged credentials to address *'critical talent shortages'* (IBM, 2017).

The MOOC and corporate online learning sectors are not short of proposed solutions in the B2B corporate learning space with Coursera, EdX, Futurelearn and others exploring how best to adapt existing courses to corporate needs (Shah, 2018). New providers and new approaches are also being explored, with large corporates not afraid to be lead partner with colleges and technology providers to shape products to their needs (see, for example, Boeing, 2018) and with partnership models collecting class and workplace learning also popular (Kinash et al, 2016).

The complex nature of the corporate space blending content, collaboration and time specific context is overwhelming to busy learners and creating demands for new forms of integrated technology platform. New, more immersive environments are being explored for simulations (Velev and Zlateva, 2017) and Chandra et al (2009) highlight the value of learner *'trust and familiarity' as well as 'perceived playfulness'* (specifically for virtual worlds) as ways of using immersive learning environments to build *'cognitive absorption'* – a state of *'deep involvement'.* More generally, Bersin (2018 – ii) talks of the progressive sidelining of the learning management system and emergence of *'Learning experience platforms'* that will provide a highly personalised experience to connect personal needs to appropriate learning pathways. Adaptive learning technologies are also likely to be in demand with the emergence and progressive acceptance of xApi leading to the possibility of personalised portfolios that can connect to corporate learning systems and Educational accreditations (Betts, 2018; Ark, 2020). The potential to map learner progress against perceived level of engagement in order to highlight the need for appropriate support interventions is currently people based, but the potential to adopt machine learning based tools is also being considered.

The combination of knowledge obsolescence, knowledge development, changing nature of learners and growth of machines makes it difficult to predict what knowledge will be valued and what modes of education will most be valued in future (Saracco, 2018) but it remains important to know *'how to ask the right question and "whom" to ask',* a goal the digital educator will continually keep in mind in learning design. AI and 'expert' systems can go some way toward mobilising knowledge at the right time for such complex problems, as illustrated by the successful use in treatment of depression in Germany (Berger et al, 2017).

In conclusion, for Learning Industry trends:

- Lifelong learning and knowledge access will be increasingly required to support corporate and individual learners
- Knowledge decay and development will both accelerate
- Microlearning and similar trends will accelerate, ironically at the same time as more complex global challenges will emerge
- The partnership of man, machine and learning will need to be considered

6. Digital Inequalities

Digital technologies played a crucial role in the continuation of education at all levels during the Covid-19 pandemic. However, Covid-induced lockdowns highlighted disparities in access to, affordance of, d skills to use those technologies both domestically, within and across the UK, and globally.

6.1 UK context

The UK's Digital Poverty Alliance (https://digitalpovertyalliance.org/) defines digital poverty as "the inability to interact with the online world fully, when, where and how an individual needs to", encapsulating both issues related to access to digital technologies but also skills gaps in effective use. With Nesta subsequently defining data poverty as "individuals, households or communities who cannot afford sufficient, private and secure mobile or broadband data to meet their essential needs".

The UK Digital Poverty Evidence Review produced by the Digital Poverty Alliance (Digital Poverty Alliance , 2022) reports that during 2021 20% of children who were home schooling did not have access to a suitable device and 1.7 million households were offline, and 21% solely accessing the internet via smartphones. The Nominet Digital Youth Index utilises quantitative and qualitative data from 4,000 8 to 25 year olds via surveys and interviews with young people, parents, carers, social and youth workers. According to the 2022 Index, 26% of young people do not have access to a laptop or equivalent device. Of those with access, only 79% can access it whenever they want, 35% of young people cannot do everything that they want to online because of the limits of their family's data allowance, whilst 16% (2.3 million) use mobile data as their primary way of connecting to the internet.

Of those households that are online, there are disparities in both the connection method and bandwidth available both nationally and locally. In May 2021 by constituency the UK average download speed was 85MBps however on average 7% of households have connection speeds of <10MBps with some regions disproportionally affected. With upload speeds being generally less than download speeds. ((Tomlinson, 2017)).

The UK government has defined a decent broadband connection as one that can "deliver 10 megabits per second (Mbps) download speed and 1 Mbps upload speed (along with other defined quality parameters). Ofcom has defined an affordable connection as one that costs less than £45 per month." The Universal Service Obligation provides a legal right to request a decent broadband connection, up to a cost threshold of £3,400 per premises, where it is currently not being met. In 2021 this was 122,803 residential premises ("Interactive report", 2022). The recommended bandwidth for a group video call on Zoom for high quality video is 1.0 Mbps/600kbps (up/down) ("Zoom system requirements", n.d.)

The availability of mobile data across the UK indoors from at least one operator is very high (99% 4G, 100% data, 100% voice), but decreases for all providers resulting in a lack of choice in some areas.

Table: % Mobile coverage premises (indoors), all networks (Ofcom Connected Nations 2021: Interactive report)

Region	4G	Data	Voice
UK	81	98	94
England	82	99	94
N. Ireland	66	95	82
Scotland	82	97	93
Wales	74	96	90

Definitions used:
4G: launched in 2012, can provide over 10MB/s and is used to deliver voice, text and higher speed data services.

Data: 3G and lower speed 4G data services where either are likely to provide a connection speed of at least 200KB/s for nearly all connections.

Voice: nearly all 90-second telephone calls should be completed without interruption from any 2G, 3G or 4G connection.

Digital skills gap

The Digital Youth Index 2022 reports that 20% of young people do not feel that they have received the grounding they need through foundational training in school to help them to use digital technology through essential digital skills relevant to everyone, 51% reporting that they learnt digital skills by themselves. Additionally, teachers report that young people find it difficult to search for the correct information, access files, effectively manage a filing system, and search for documents to help with homework and online learning.

The UK's benchmark for the digital skills needed for life and work is the Essential Digital Skills framework. The EDS framework, defined by the UK's Department for Education ("Essential digital skills framework", 2019), sets out 5 categories of essential digital skills for life and work, these are:

- communicating
- handling information and content
- transacting
- problem solving
- being safe and legal online

An annual survey of Essential Digital Skills is conducted by Ipsos Mori on behalf of LLoyds Bank. For the 2022 survey, a nationally representative sample of 4,099 participants aged 18+ years in the UK (Great Britain and Northern Ireland) were interviewed via telephone, the data was weighted to represent the UK population in relation to several demographic factors.

According to the 2022 Essential Digital Skills survey the overall UK average of people who achieved Essential Digital Skills for Life and Work were:

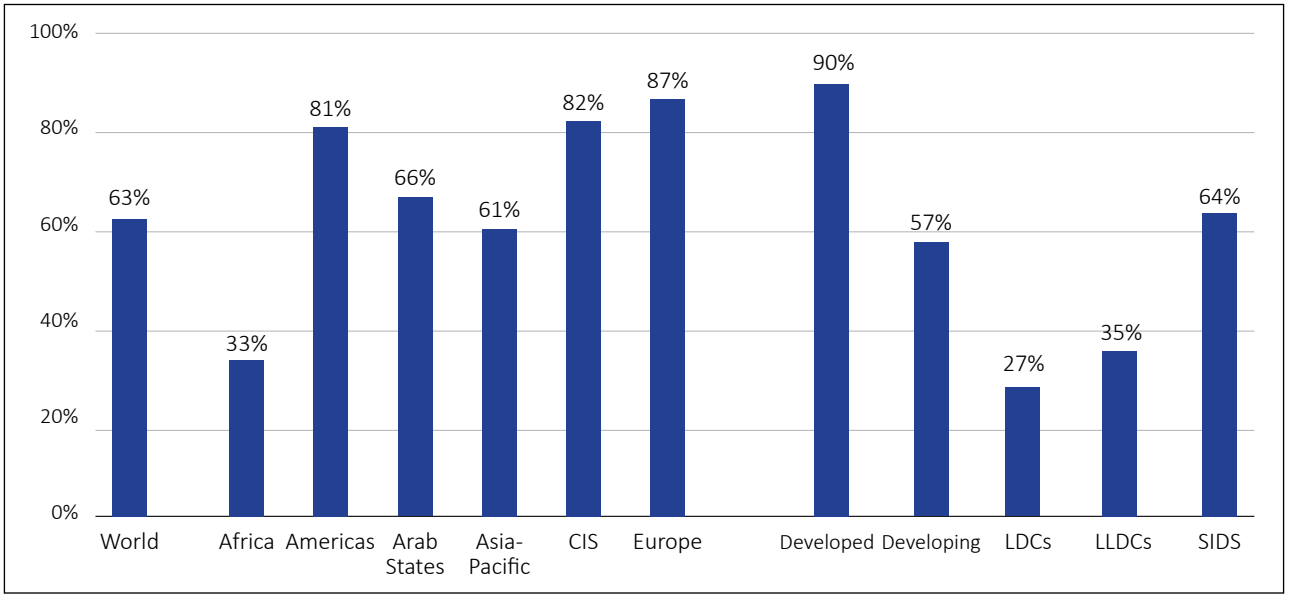
EDS	Zero Skills (0 skills)	Partial Skills (1-4 skills)	All Skills (5/5 skills)
Life	5%	7%	88%
Work	8%	14%	78%

With variable individual task capability.

6.2 Global context

In 2021 approximately 63% of the world's population had accessed the internet at least once within a 3-month period. However, access to the internet is largely dependent on geographic and demographic factors with 2.9 billion remaining offline, of whom 96% reside in developing countries ("Measuring digital development", n.d.).

Percentage of individuals using the internet 2021*



*ITU estimate Source: ITU

Image source: https://www.itu.int/itu-d/reports/statistics/2021/11/15/internet-use/

Commonwealth of Independent States (CIS) region
Small island developing states (SIDS)
Least developed countries (LDCs)
Landlocked developing countries (LLDCs)

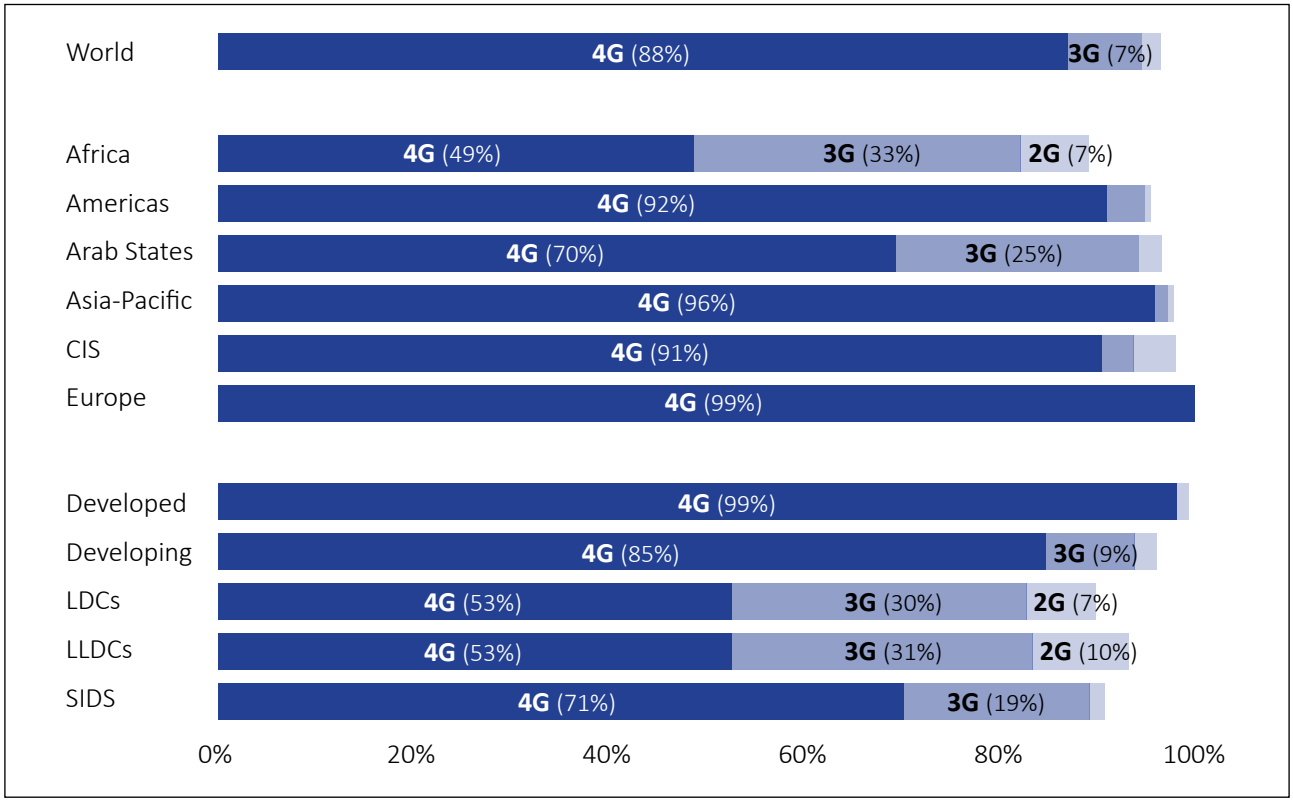
Subscriptions per 100 inhabitants, by region, 2021

Region	Fixed-telephone	Fixed-broadband	Mobile-cellular telephone	Mobile Broadband
World	11	17	110	83
Africa	1	1	83	41
Americas	20	23	119	103
Arab States	10	9	98	67
Asia-Pacific	8	17	112	87
CIS	16	20	146	94
Europe	31	35	118	105
Developed	32	36	135	131
Developing	1	13	105	74
LDCs	1	1	76	39
LLDCs	3	3	77	43
SIDS	11	8	87	57

Data source: https://www.itu.int/itu-d/reports/statistics/2021/11/15/subscriptions/

The access to Information and Communication technologies varies greatly globally. Although most internet connectivity is via mobile broadband, there is disparity in both coverage and the bandwidth available, affecting what services can be meaningfully accessed.

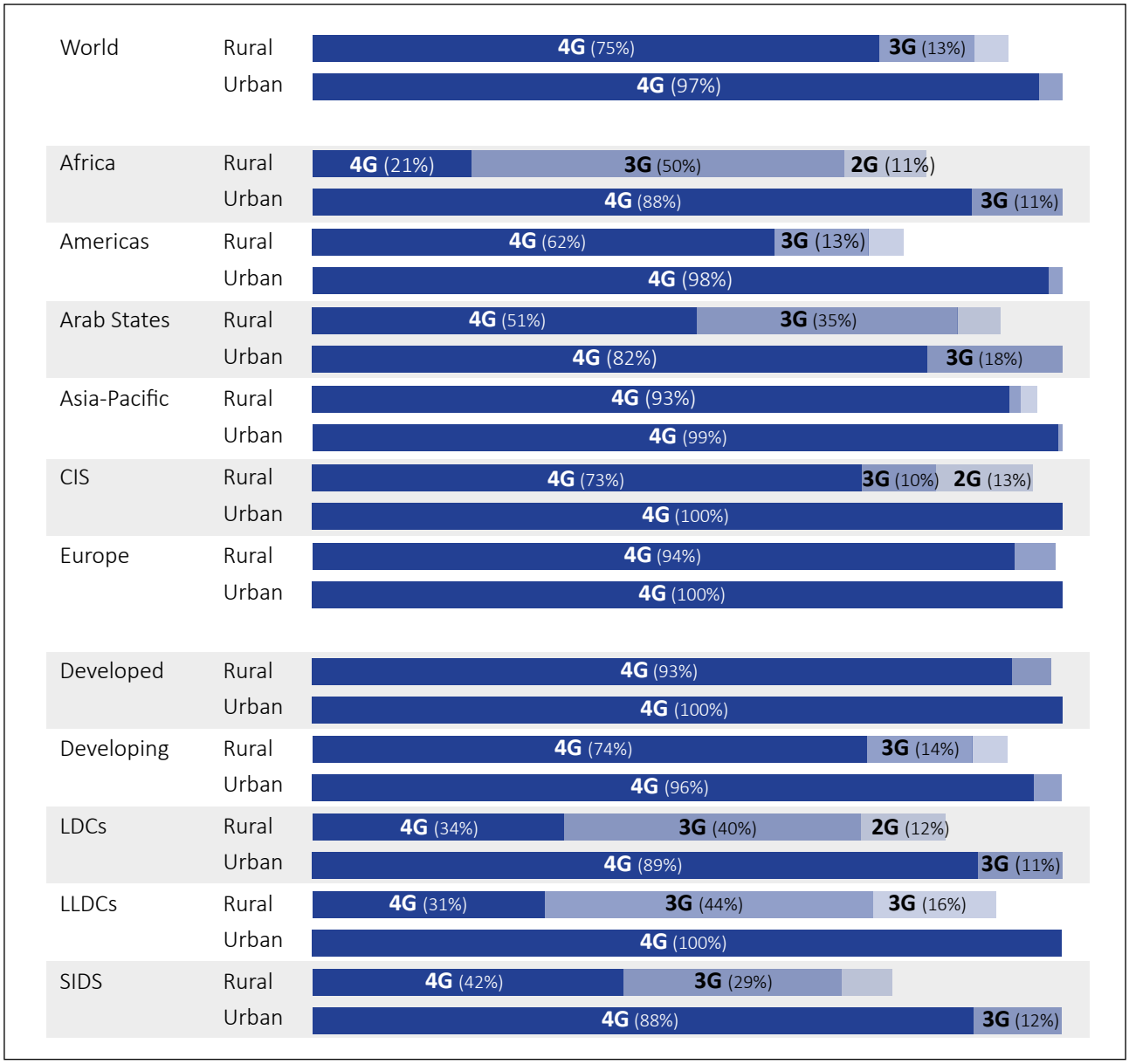
Population coverageby type of mobile network, 2021*



* ITU estimate Source: ITU

Note: The values for 2G and 3G networks show the incremental percentage of population that is not covered by a more advanced technology network (e.g. 95% of the world population is covered by a 3G network, that is 7% + 88%).

Population coverage by type of mobile network and area, 2021*

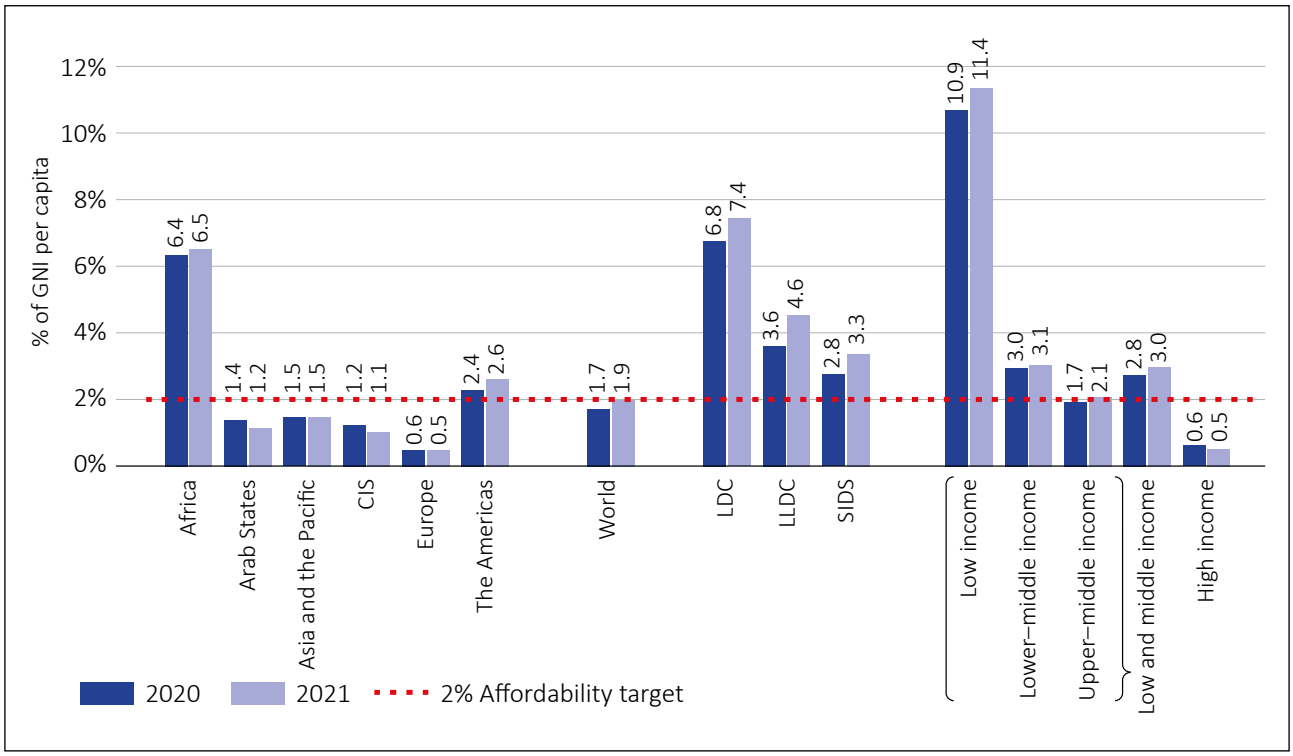


* ITU estimate Source: ITU

Note: The values for 2G and 3G networks show the incremental percentage of population that is not covered by a more advanced technology network (e.g. 95% of the world population is covered by a 3G network, that is 7% + 88%).Despite the United Nations Broadband Commission for Sustainable Development aims to make broadband prices affordable in developing countries by 2025, in many economies, connectivity remains unaffordable with some areas seeing increased costs in 2020-21 in response to the global pandemic.

Despite the United Nations Broadband Commission for Sustainable Development aims to make broadband prices affordable in developing countries by 2025, in many economies, connectivity remains unaffordable with some areas seeing increased costs in 2020-21 in response to the global pandemic.

Figure 5: Data-only mobile broadband basket prices



Source: ITU and A4AI

Note: By world region and level of development, expressed as a percentage of monthly GNI per capita, 2020–2021. Medians based on the 185 economies for which data were available for both years. Economies are benchmarked according to th eprice of an entry-level data-only basket, defined as the cheapest data-only mobile broadband subscription available domestically, with a 3G technology or above and a minimum monthly data allowance of 1.5GB for 2020 and 2GB for 2021.

Image source: Affordability of ICT Services report 2021

Many low- and middle-income countries opted for non-digital education continuity strategies for their children and young people during the pandemic (Facer & Selwyn), while “remote learning remains out-of-reach for at least 500 million students” (UN’s ‘SDG Goals 2020’ report). The UNICEF Innocenti (2020) survey data from 127 countries during the first wave of school shutdowns of 2020 found television to be the most-used medium of education provision (75%), supported by radio (58%) and take-home resource packages such as books and worksheets (48%). However, this did not necessarily mean that all were able to continue their education. Among the poorest 20% of households, just 7% owned a radio in Ethiopia and none owned a television. (UNESCO (2020: 16))

6.2.1 Additional barriers

By the end of 2021 there were 89.3 million forcibly displaced people worldwide, of whom:

- 53.2 million internally displaced people
- 4.6 million asylum seekers
- 27.1 million refugees
- 4.3 million stateless people

486,300 returned refugees (https://www.unhcr.org/refugee-statistics/)

Mass displacement continues to grow, 83% are hosted in low- and middle-income countries with the least developed countries providing asylum to 27% of the total. Refugees, stateless people and those internally displaced often reside in climate change “hot spots” and may be exposed to secondary displacement. The

UNHCR reports that hazards from extreme weather events are already causing an average of more than 20 million people to leave their homes and move to other areas in their countries each year, some are forced to cross borders (Refugees, n.d.).

The UNHCR 2016 Connecting refugees report identified number of barriers to connectivity for refugees in urban, camp and rural settings, including a lack of affordable devices and mobile services, weak network signal strength and challenges with charging devices. In addition, regulatory restrictions can result in ID-related policy barriers to the availability of connectivity, making it more difficult for displaced persons to access services (Displaced and disconnected report 2018). For example, prior to 2006, no African country mandated SIM registration — across the continent one was able to purchase a prepaid card and use it more or less anonymously, whereas as of July 2018, only a handful countries had not introduced mandatory SIM registration into law.

The average length of displacement for refugees is 17 years, with many young people being born and educated in displacement. Education is key to refugees becoming independent and contributing to local economies and the development of host countries ("UNHCR- Comprehensive Refugee Response Framework", n.d.). However, of the 27 million refugees worldwide, only 5 percent have access to higher education. There are a number of contributing factors, including but not limited to: access to and evidence of pre-tertiary education, legal status, and access to and cost of tertiary education ("Six steps to improve access to UK higher education for displaced students", 2022).

The Connected Learning in Crisis Consortium was formed in 2016 to unify innovative and digital education efforts focused on meeting the under met needs of refugees and displaced communities. It has attracted engagement from a wider set of actors, formalized the practice of experience-sharing, established the groundwork for a dynamic community of practice, and strengthened networking across programs (Connected Learning in Crisis Consortium, n.d.).

In 2017 the Consortium published the first edition of its Playbook for quality provision of Connected Learning in contexts of crisis and displacement. The Playbook has 4 areas of focus, these are:

- Access to Higher Education,
- Learning Pathway Design,
- Connected Learning Pedagogies,
- and Academic Support.

With quality provision checklist items including contextualised education experiences, informed resource design considering technological limitations, draws on local resources, and has appropriate and accessible support and counselling services for academic support, personal development, and psychological wellbeing.

6.3 Implications for Higher Education

Although internet technologies are ubiquitous, there is a significant gap between availability of these technologies and access to them, with varying levels of digital capabilities both at local and global levels.

The Covid pandemic highlighted that assumptions on access to technology cannot easily be made, nor of educators' or students' digital capabilities.

Recent geopolitical, environmental, and healthcare crises have highlighted the need for resilient learning design and approaches to teaching and learning infrastructure. Students need to be met where they are academically, physically, and psychologically especially in online and distance education contexts. In addition, the content and construction of curricula and associated materials need to be contextually appropriate.

7. Sustainability

The QAA and AdvanceHE guidance Education for Sustainable Development in Higher Education takes a holistic approach to sustainability, defining two key terms:

- Sustainable Development- an aspirational ongoing process of addressing social, environmental, and economic concerns to create a better world.
- Education for Sustainable Development- the process of creating curriculum structures and subject-relevant content to support sustainable development.

The early 2020s thus far have unveiled several interconnected crises: geopolitical, health and environmental, leading to new discussions of a risk society, which continues to face novel kinds of threats, dangers and uncertainties that are fundamentally uncertain and incalculable (Selwyn, 2021). These are forcing us to rethink our ideas around education, and how that education is delivered.

An example of this is the University of Edinburgh's Higher Education Futures scenarios, comprising a set of 8 provocations for discussions on the future of our universities and the education that they provide. Their aim is to unsettle assumed futures and support us to imagine new, desirable ones. Depending on your viewpoint, some scenarios are more desirable than others.

7.1 Environmental Impact and Climate Crisis

Universities have a key role to play in addressing climate, both in their own actions and their influence. Their impact on climate change can be considered across 4 stages:

- University
- Bridging Actors
- Society,
- and Ecosphere

Incorporated within the University stage are actions of staff and students, and of the institution itself encompassing organisational structures, carbon emissions and investments (McCowan, 2020). Additionally, the HE Climate Action Toolkit ("Climate Commission: HE Climate Action Toolkit | EAUC", n.d.) identifies 5 main themes to support attainment of UK HEI climate action targets, these are:

- Leadership and governance
- Community and engagement
- Research and knowledge exchange
- Teaching
- Campus management

The toolkit recommends the adoption of sustainable procurement procedures. ISO 20400:2017 defines sustainable procurement as "procurement (3.18) that has the most positive environmental, social and economic impacts possible over the entire life cycle (3.12)" ("ISO 20400:2017(en), Sustainable procurement — Guidance", n.d.).

The University of Exeter's Digital Humanities Lab in the overview of their project 'Sustainable ICTs in the Digitised University' note that "Digital tools have a key role to play in building a low carbon academy, but they also have environmental impacts that must be uncovered if the transition to a green economy is to be successful" and that these are often overlooked in institutional calculations of their environmental footprint ("Sustainable ICTs in the Digitised University | Digital Humanities | University of Exeter", n.d.). An example of this is email. The Carbon Literacy project reports that 306 billion emails were sent in 2021, with a carbon emissions range of between 0.03g and 26g per email, accounting for approximately 0.3% of global emissions in 2019 (Phipps, 2022). Watching videos online accounts for 60% of internet traffic and approximately 1% of global emissions (Griffiths, n.d.).

The acquisition of raw materials for hardware production is often environmentally damaging and, in some cases, illegally acquired, for example, so-called "Blood Gold" which is illegally extracted in both Africa and South America. There is some evidence to suggest that Blood Gold from Brazil his finding its way into the supply chains of leading technology, electronics, and automotive industries. Many of these raw materials and rare elements are incorporated into single use devices such as batteries ("BLOOD GOLD | Is your cell phone or electric car stained with Indigenous blood from the Amazon?", n.d.).

In Ed-Tech Within Limits (Selwyn, 2011) we are asked to question the ongoing abundance of technology, and instead consider it's curtailment by (i) the ongoing depletion of natural resources and (ii) increasingly unsustainable energy demands arising from the production and consumption of digital resources. We can no longer ignore the full life cycle of our technology production, acquisition, and content consumption.

7.2 Market size

In 2021/22, 2,862,620 students, at all levels, were enrolled at UK Higher Education providers. Of these, 278, 420 were UK based distance learning students and 465 were non-UK based student (funded), this does not include students who were Non-UK based for the duration of their course. Of the Open University's 151, 840 students, 151, 505 were UK based distance learning students. 4,050 of the University of London (Institutes and activities)'s 4,290 students were UK based distance learning students ("Table 60- HE student enrolments by HE provider and location of study 2014/15 to 2021/22 | HESA", n.d.).

Statista estimate the global revenue from online education in 2023 to reach £132.78bn, rising to £174.65bn by 2027. Most revenue, 62.3% in 2023, is generated via online university level education. For the UK market, the 2023 projected revenue is £7.51bn, rising to £10.00bn by 2027, with online university education anticipated to account for 91.7% of 2023 revenue, rising to 92.4% in 2017. King's College London is projected to have the largest market share at 3%, based on October 2022 data. Big increases in revenue on the previous year for online university education were seen in 2020 (28.9%) and 2022 (26.9%), however there is an expected continual decrease in growth from 2023 (17.8%) to 2027 (5.8%).("Online Education- UK | Statista Market Forecast", n.d.). Interestingly, the Open University is not identified as one of the top brands.

Statista breakdown online education into three sectors: Online learning platforms (courses and credentials from Udemy, Coursera, Babbel etc.), Professional Certificates (certification offered through insitutes and study prep companies such as PMI and Kaplan) and Online University Education (university designed and delivered courses and credentials). In terms of users, Online University Education has the lowest proportion. In the UK in 2022, Online Learning Platform had 7.99 million users, Professional Certificates 1.16 million and Online University Education 0.56 million. Globally, Online Learning Platform had 681.9 million users, Professional Certificates 41.53 million and Online University Education 22.89 million. With proportionally the biggest growth by 2027 anticipated in Online University Education users, rising to 41.59 million globally, and 0.96 million for the UK ("Online Education- UK | Statista Market Forecast", n.d.).

Online Education is a growing market and is expected to continue to grow, albeit at a slower rate than during the Covid pandemic. In 2021/22 only 9.7% of enrolled students at UK HE providers at all levels were UK based distance learning students. This may be an area of growth. Of those undertaking professional training, these are predominantly highly qualified individuals of an above average income 'Target Group: Online education & e-learning users in the UK' (Statista, 2023).

7.3 Financial Sustainability

There are increasing concerns in the UK Higher Education sector around the financial stability of the sector and the sustainability of the current fee structure. Risks to financial stability include increased operating costs due to inflationary pressures and failing to meet student number growth targets. Student recruitment and retention may be affected by rising living costs, which are anticipated to have a greater impact on providers with higher numbers of students from disadvantaged and underrepresented backgrounds.

However, it is well recognised that the current UK home student fees do not cover the cost of the costs of provisioning undergraduate home student education. International student fees are used to offset these

costs (Office for Students, 2022c). In 2021 the UCAS applications from EU domiciled students dropped to 31,670 from 56,865 in 2020, increasing dependence on non-EU students ("UCAS Undergraduate sector-level end of cycle data resources 2021", 2021). In 2020-21 the highest proportion of non-EU students studying at UK HEIs were from China, 30.4%, followed by India, 18.4%. There was no growth on the number of Chinese students in 2020-21, compared to 2019-20, whereas there was an almost 50% increase in the number of students from India. There was also a large increase in the number of students from Nigeria. With regards to post-graduate taught students, in 2020-21 50% of HEIs recruited 50% or more of their international student from one country, with 32% recruiting from just 2 countries. However, the biggest growths in international student enrolments in recent years have been in Australia and New Zealand (Ilieva, 2022).

Attractiveness of study destination is an important choice factor. The 2021 IDP Connect New Horizons survey found that 17% of respondents considered the UK as their first-choice destination for international study, but that the UK was in the consideration set for 48% of respondents. Respondents were more likely to consider studying in a specific country if it offered an opportunity to study at a higher-ranked institution. Other factors that made a country more attractive included migration incentives, post-study work rights and 'study hub' support (IDP Connect, 2021).

In February 2022, the Prime Minister Rishi Sunak suggested that restrictions on international student migration, and the ability for family members to travel with them may be introduced (Brown, 2022). The Graduate Visa which was introduced in July 2021, allowing graduates of UK institutions and their dependents at least two years of unrestricted work rights in the UK is thought to be a key driver of a rapid recent increase in visa applications ("How might changes in student visa provision affect UK immigration levels?", n.d.). Any reduction in post-work study rights is likely to reduce the desirability of the UK to international students. Additionally, the intention of the QAA to stand down as the designated quality body for English Higher Education reduces risking the reputation of English Higher Education, it's standards and desirability for international students ("What does it mean to lose a designated quality body?", n.d.).

8. Ethics

In the forward for 'Critical Digital Pedagogy- A Collection', Ruha Benjamin states "I am convinced that without a deep engagement with critical digital pedagogy, as individuals and institutions, we will almost certainly drag outmoded ways of thinking and doing things with us. If we do not reckon honestly with what all we have been carrying, many dead ideas are sure to be repackaged as new and innovative "tech solutions" for the converging public health, social, political, and economic crises we face"(Benjamin, 2020). To continue as is, we risk further embedding inequalities and bias into ever increasingly automated systems and digital services.

Writing in the FT in 2020 Arudhati Roy closes with:
"Historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different.

It is a portal, a gateway between one world and the next. We can choose to walk through it, dragging the carcasses of our prejudice and hatred, our avarice, our data banks and dead ideas, our dead rivers and smoky skies behind us. Or we can walk through lightly, with little luggage, ready to imagine another world. And ready to fight for it."(Roy, 2020)

What future do we want?

8.1 Technology and Society

Technology shapes and is shaped by society. In 'Rebels Against the Future', Sale poses key questions when considering the impact of technologies on society (Sale, 1996):

- Is this technology nothing but an improved means to an unimproved end?
- Who are the winners, and the losers?
- Will this technology concentrate or disperse power, encourage, or discourage self-worth?
- Can society at large afford it?
- Can the biosphere?

Bias is well documented with regards to how big data increases inequality and threatens democracy (see Virginia Eubanks' Automating Inequality (Eubanks, 2018) and Cathy O'Neil's Weapons of math destruction), but not restricted to algorithmic based systems. In her book 'Race After Technology' Ruha Benjamin discusses multiple examples of embedded discrimination including the colour-balancing cards used in colour photography. The Kodak Shirley Cards, used for standardising the exposure process used the image of a White woman. This resulted in darker skinned people in photographs being under exposed. Although this was a known issue for several years, it wasn't addressed until manufacturers of brown goods such as chocolate or wood complained about the lack of subtlety and detail in the photographs of their products. Similarly, it discusses the use of near infrared detectors in a hotel's automated soap dispensers where, due to the reliance on reflected light, the dispenser only works on light coloured skin and not darker skin shades.

8.2 The Trouble with EdTech

With a global EdTech market estimated to reach approximately USD 218 billion in 2027, we need to consider who these technologies are both serving and potentially exploiting.

In 2021 the Association for Learning Technology (ALT) published its Framework for Ethical Learning Technology (FELT). The framework consists of 4 areas, these are: Awareness, Professionalism, Care and Community and Values. The framework was developed in response to large school adoption of learning technologies during the Covid-19 pandemic. ALT define learning technologies as the broad range of communication, information and related technologies that are used to support learning, teaching and assessment (mdeepwell, 2020).

The rapid acquisition and deployment of technologies during the pandemic sparked concern around digital accessibility and unethical technology (Ahern, n.d.). Laura Kalberg (Admin, 2019) defines unethical technology as technology having:

- Inequality in distribution and access
- Lack of accountability and responsibility
  - Misinformation
  - Profiling
  - Automated decisions
  - Targeting
  - Insufficient Security
- Environmental Impact
- Business ethics
  - Proprietary lock-in
  - Industry monopoly
  - Tracking
  - Data brokers

A potential example is the plagiarism detection tool TurnItIn which has come under ongoing criticism for numerous reasons. The platform relies upon the corpus of text students upload to train and facilitate its matching algorithm, without any compensation to students for using their IP (Warner, n.d.). Additionally, like most learning technologies the use of the tool is often a requirement from the students' institutions, removing any choice or notion of consent from the student.

In early 2023 TurnItIn initially aimed to embed an AI writing detection tool into its platform that could not be disabled. Due to strong opposition from the Higher Education community, it was released into the main platform but can now be disabled. Turnitin claimed 98% accuracy for the detection tool on launch but has since found a higher-than-expected false positive rate when deployed and has amended how the platform assesses the text being reviewed("Are Innocent Students Paying the Price for Turnitin's AI Detection Flaws?", 2023) . The detection tool created by OpenAI can only correctly identified 26% of AI-written English texts. It also incorrectly labelled human-written texts as probably written by AI tools 9% of the time(Taylor, 2023).

In addition to the FELT, the ALT Anti-Racism and Learning Technology Special Interest Group developed a Anti-racism content development reflection tool and guidance for Bringing anti-racism into learning and instructional design frameworks("Learning Technologists' Anti-Racism Tool", n.d.). The aim of the tools was to address structural racism embedded within learning content and the selection of learning platforms considering:

- **Content:** Is there a geographic, ethnic, racial, personal point of view presented? Who can we engage with to gain input to ensure content addresses anti-racism?
- **Tools and platforms:** Who made this tool? What is their standpoint on the role of structural racism as it relates to their products? Who is the intended audience(s) for this tool?
- **Context:** In our institutions, how can we ensure there is representation of Black, Asian and minority ethnic populations? Is the underrepresentation of BAME staff, including in higher level roles, a consideration, and how can we address this as it relates to the production of content for digital learning?
- **Distribution:** How can we address the key aspects of access to digital infrastructure in our sectors?
- **Evaluation:** How can we influence the design of evaluation of projects to consider the impact on all students? How can we make this evaluation a priority?
- **Research findings:** If asked to identify research findings to support any developing projects, can we find research that raises the voice of BAME students? How can we put ourselves forward to further this research?

In 2019, UCL came under criticism for the lack of Africa in African Studies via an open letter. Students who attended the African Studies Masters course in 2017-18 reported that 87% of the key readings course were from white authors and that they were being asked to think of "Africa as a reflection of Eurasia,". There were also reported misrepresentations of the origins of the Trans-Atlantic Slave Trade (Odugbemi, 2019), highlighting issues around Content and Context. These need to be taken into consideration when developing international online and distance education programmes, otherwise there is a risk of reinforcing colonial paradigms.

8.3 Summary

Writing on the Purpose of Education in 1947-8 Martin Luther King Jr stated:

"The function of education, therefore, is to teach one to think intensively and to think critically. But education which stops with efficiency may prove the greatest menace to society. The most dangerous criminal may be the man gifted with reason, but with no morals."(University *et al.*, 2015)

When considering the role of technologies in education, this leads us to the questions:

- Whose techno-imaginaries?
- Whose beliefs and values?
- Where is the power?
- Whose data?

9. Conclusions - what are the implications for educators?

The Great Leap Online of 2020-2021 showed how core teacher-learner and learner-learner transactions normally reserved for on-campus, in-person, learning can be managed remotely, online, albeit with variable quality and hence success. The big questions therefore are what path should higher education take in the wake of the pandemic and how should we prepare for the next big disruptor that will surely come along? Should we return to "business as normal" or can what we know about distance education help us to do better?

Distilling the eight themes together, overall, the challenge to educators remains both how to assess potential benefits of new technology and how best to assure return on personal and institutional investment through successful adoption and benefits realisation. Most Institutions will need to assess how best to monitor appropriateness of technology to suit institutional and individual learning needs and will develop adoption strategies aligned to users, investments and the anchors of established technologies. Similarly, individual teachers will need to weigh the pros and cons of particular tools and technologies.

Decisions will need to be made against a backdrop of discernible trends:

- Learner habits are evolving rapidly, creating an increasing challenge to educators of 'understanding the modern learner' and of keeping up with learner expectations
- Consumer based technology and the legacy effects of Covid-19 will continue to set high expectations for learning tools, and environments
- MOOC providers are likely to continue to be catalysts for ongoing innovation and change including *degree partnerships and new forms of credentials such as personal portable learning portfolios and credit records maintained independently by the learners themselves via third party providers*
- The importance of digital literacy is likely to see demands for enhanced digital skills development in higher education from both learners and potential employers
- The selection and use of teaching tools will increasingly be for learning effectiveness rather than 'newness' – pedagogy will be more important than novelty
- In the short term, structured LMS's are likely to become more open to support a learning 'ecosystem'
- In the longer term AI and other advanced technologies are likely to grow in importance
- The value of testing, data analytics and learning pathways are likely to increase to support enhanced engagement and learning
- Flexibility of choice and agility of adoption will be important determinants of effectiveness.
- Significant gaps between availability of new technologies and access to them, with varying levels of digital capabilities both at local and global levels will limit universal adoption of new technology.
- Recent geopolitical, environmental, and healthcare crises highlight the need for resilient learning design and approaches to teaching and learning infrastructure.
- Growing awareness of ethical issues and inbuilt bias in technology based solutions will require more student-centred and context-aware learning design.
- Sharing knowledge of what works and Faculty exposure to new tools and methods will be necessary to encourage adoption but educators are somewhat overwhelmed and need to be better supported in their use of digital technologies.

Three specific areas of focus are suggested by this review:

1. Learning design
2. Faculty support
3. Technology assessment

9.1 Learning design

The challenges to educators to develop new programme design and delivery skills in parallel to the evolution of digital learning have been recognised for some time (see, for example, Salmon, 2000 and 2004 or Proserpio and Gioia, 2007). Salmon's five phases of online learning activity (*access and motivation, online socialisation, information exchange, knowledge construction and development*) highlighted the need for educators to support and then engage students through these stages with use of appropriate techniques (from initial familiarity with technology through management and moderation of discussion threads to group identity, knowledge transfer and reflection). The methods and tools to enable these stages, however, are evolving rapidly.

Mishra and Koehler's TPACK model (2006) suggested that educators would need to develop technology, content and pedagogical knowledge. The model also highlights that the content (*what is taught*) and pedagogy (*how it is taught*) informs the appropriateness of any technology used. Moore (2005) highlights the need to consider the five pillars of learning effectiveness, cost effectiveness, accessibility, faculty satisfaction and student satisfaction to achieve good quality online learning.

Picciano (2017) highlights the continued challenge of defining blended learning, recognising that the nature of the blend can vary from supporting learning through to a transformational learning activity. Picciano (2009) notes the confusion that can result and highlights the value of '*blending with pedagogical purpose*', stressing that educators need to think of objectives prior to selection and use of technology from the vast range of options available.

Redecker and Punie (2017) stress the need for a process of continuous exploration, evaluation and adoption of learning technologies in order to blend technology and effective learning practice and propose six stages for adoption of new technologies: *Awareness, exploration, integration, expertise, leadership* and *innovation*. Embedded within this framework is the pivotal process of socialising new technology within the peer group in order to achieve widespread acceptance. JISC (2009) highlight the value of learning activity design, a process of considering the most effective combination of activities, technologies, people (learners, peers, tutors facilitators etc) and learning outcomes.

Adams Becker et al (2017) highlights the need for development of:

- Designs that blend formal and informal learning to enhance engagement
- Student digital literacy skills to prepare for the workplace
- Improved routes to access learning and learner retention
- Management of knowledge obsolescence – both in terms of teaching practice and long-term learner effectiveness
- Faculty support for *'technology and pedagogy discovery'* to ensure ongoing learning impact

They also recognise that these challenges are complex; the first of these may be solvable to some extent over the next 2 years but all are part of an ongoing process of change in the higher education sector.

9.2 Faculty support and development

Skiba 2017 notes the need for Universities to support *'faculty experimentation, programmer and instructional design support, and faculty and administration problem solving'* and also recognises the re-emergence of collaborative learning focusing on *'placing the learner at the center, emphasizing interaction, working in groups, and developing solutions to real challenges'*

Looking to the future it is likely that educators will be faced with the dilemma of how best to fulfil more roles than they can optimise. Watanabe-Crockett (2018) highlights the need for educators to develop deep understanding of technology in terms of its teaching potential, but also stresses a need for educators to be sensitive to learners' online safety, digital literacy, and both global and digital culture when teaching online. Kezar, A (2016) recognises that there is increasing pressure for faculty roles to evolve, moving beyond teaching and research to also adopt new techniques, compete with for profit institutions and (potentially)

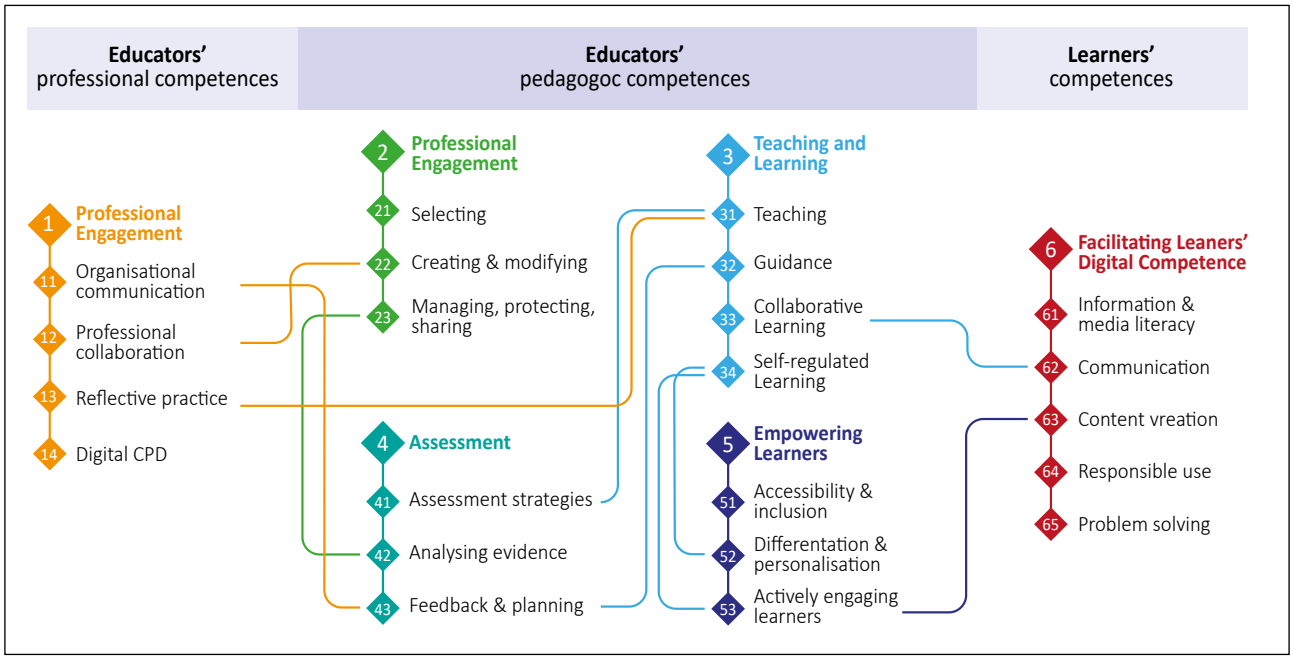
adopt new forms of contract. Jaschik and Lederman (2017) suggest that there is still some debate (and variation) in Institutional support for teaching online, and question as to whether institutions compensate fairly for online course development. Open discussion and debate on appropriate compensation models is needed, as is support for the innovative digital educator. As Skiba (2017) points out some early innovators seeking to embrace digital pedagogies ended up being

'fearful of getting terrible course evaluations because they were challenging the status quo'.

Redecker and Punie (2017) highlight a wealth of different competencies that will be required for the educator to support the learners and learning designs of tomorrow. Their EU 'DigiCompEdu' framework outlines 22 educator-specific digital competences are organised into 6 areas. Subject specific and base digital competencies will be key enablers for educators, with key pedagogic competencies relating to:

- Selection, creation and management of digital assets
- Design of a blend of appropriate teaching, collaborative and solitary learning experiences
- Empowerment of all learners through accessibility, personalisation and engagement tools
- Assessment on a foundation of strong analytics to provide personal feedback and planning

The EU framework highlights the value of connection between Educator professional competencies, Educator pedagogic competencies and Learner competencies as illustrated below.



JISC (2014) also point to key elements of digital literacy:

- *Learning skills* – ability to both study and learn in formal and informal digital environments
- *Digital scholarship* – ability to participate in practices (academic / professional / research) that relies on digital
- *Information literacy* – effective information access, evaluation, management and sharing practices
- *Media literacy* – ability to engage with content in multiple formats
- *Communications and collaboration* – ability to participate in digital networks
- *Career and identity management* – ability to manage reputation and identity online
- *ICT literacy* – ability to use and adapt systems and services to needs

New faculty roles and critical competencies are likely to emerge, and support for faculty transition and development will be required. McKenney and Mor (2015) describe the increasing recognition of teaching as a *'design science'*, calling on the blend of educational design, analytics and inquiry for effective results. Jaschik et al 2018 highlight the need for teaching and development of faculty to (mostly US based) senior leaders, with 94% of institutions offering some form of professional development for faculty members on teaching with technology, 87% on use of assessment systems and 60% on how best to evaluate the effectiveness of digital tools. Conrads et al (2017) recognise the importance of *'supporting teachers and strengthening their capacity to meaningfully integrate digital technologies into education'* as a key priority in digital education policies. Europe-wide policies have evolved from infrastructure and innovation foci to recognise the role of educators in exploring, adopting and adapting learning technologies to learning objectives.

At a base level, the learning professional's familiarity with digital communication and delivery will need to increase. Applying this knowledge to selection, develop and manage digital resources will also be a key enabler prior to mobilising the power of technology to deliver meaningful teaching and assessment. Digital tools may be expected to facilitate a more learner centric future, particularly with the potential to adapt learning pathways to personal needs and interests. Ultimately, however, the digital educator of tomorrow will need to juggle a complex mix of technology evolution, institutional adoption, learner habit, teaching practice and learning effectiveness to lead change.

The digital educator will need to:

- Continuously evolve digital competence and continuously rethinking of how to learn in a digital age
- Shift from a world of memorising knowledge to experiential learning and competency
- Continuously experiment, evaluate, socialise and integrate systems to support ongoing innovation
- For Institutions, new compensation models will be required to embrace appropriate incentives and support for digital learning innovation.

9.3 Technology assessment

Looking to the future, the longer term emergence of AI and teaching machines could lead us to a world of far greater change. The emergence and influence of technology platform providers is also likely to be significant

'If we reach a point where the agenda of universities is set by a handful of techlords, as well as the control over their information and the ethos of universities, higher education is looking ahead a very different age' (Popenici and Kerr, 2017).

The future role of technology providers and other partners needs to be carefully considered. Morriss and Stommel (2017) stress the importance of assessing whether tools say what they say they do, but also actively researching terms of service, considering data issues and impact on learning in order to avoid *'damage by working directly at odds with our pedagogies'.*

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