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DIGITAL EDUCATION AS SOCIAL PRACTICE: MAJOR TRENDS SHAPING ONLINE LEARNING FUTURES

This paper explores some of the major trends shaping the future of online learning. It asks, what might the future look like? While the paper does not set out to predict the future as the authors do not have a crystal ball, it does endeavour to provide a bigger picture helicopter view of the online learning field. It responds to the tendency to overlook the research literature during the Covid-19 pandemic and aims to help keep the future of online learning in the political spotlight. The paper establishes that defining online learning is not a straightforward task and widespread differences exist in the global use of the term. A critical multifocal perspective is then adopted to identify five macro-level trends which help to frame the analysis from different angles and viewpoints. The discussion covers much ground and draws on a wide range of literature to illustrate how the digital education ecosystem is simultaneously converging, getting larger in scale, more open and closed, and is growing in diversity. Inherent tensions across these contradictory trends demonstrate how online learning needs to be understood in terms of wider societal change forces. Accordingly, the helicopter analysis attempts to steer a path between wider social issues, the language of opportunity, and the need for deeper criticality. Throughout the paper, there is the spirit of hope as educators have considerable agency to help shape possible, probable, and preferred online learning futures.

KEYWORDS *Online Learning, Covid-19, Future Trends, Hybrid Learning, Digital Education Ecosystem.*

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1. Introduction

A wealth of literature published over the past two-years argues that the Covid-19 pandemic has been a game-changer for the future of online learning. However, the long and rich history of online distance learning did not feature prominently in our response to the pandemic (Shearer 2021). There is even a risk of undoing what is already known and losing sight of the longer-term horizon as we get caught up in the current wave of publications with a Covid-19 focus. This paper seeks to address this concern by reporting a helicopter analysis of the main trends in online learning with an eye on the future but anchored in lessons from history. In sharing this bigger picture analysis, the intention is to connect the past with the present and shape the future direction of research, theory and practice. The paper is structured around five macro-level trends:

- Convergence.
- Massification.
- Openness.
- Interactivity.
- Diversification.

A critical multifocal perspective is adopted throughout the discussion, providing a lens through which to zoom in and out from different angles and competing viewpoints. The basic assumption from this perspective is that online learning is framed by a kaleidoscope of many different colours and shapes with competing images of the future (Brown 2016). It follows that a discussion of major trends is more than just a speculative exercise of future telling as it requires a deeper critical analysis of different drivers and change forces. Put another way, all education is inherently political and online learning is no exception.

2. The definition challenge

The first challenge is to define online learning. This is not an easy task as according to Singh and Thurman (2019), the term «online learning» was first used in 1995 in the early development of the Learning management system (Lms). Since then, online learning has evolved and is a term whose meaning has become less clear over time (Irvine 2020). As Irvine (2020, 42) observes, «what used to be a simple binary of face-to-face or online has now become so extremely complex that our ability to understand each other is impaired».

The reality is that online learning is often spoken about in the context of many overlapping terms such as e-learning, blended learning, digital learning,

distance learning, flipped learning, hybrid learning, to name a few. As Johnson (2021, 2) writes in a recent Canadian report:

> While the statement that more online, hybrid, and technology-supported learning are expected seems straightforward enough, one only needs to ask what another means when they use these terms to reveal widespread differences in how these commonly used terms are defined.

Notably, Singh and Thurman (2019) identify 46 definitions of online learning in their recent literature review. Common features of most definitions include but are not limited to concepts of time, space, distance, interactivity and use of technology, particularly the Internet. While physical distance is not always an element for defining online learning, it is mentioned consistently. For this reason, the paper anchors the analysis of current trends in online learning around the following definition:

> Online learning is defined as education being delivered or experienced in an online environment either synchronously or asynchronously through the use of the Internet where learners do not need to be co-present in a physical space (adapted from Singh and Thurman 2019).

A wealth of literature falling under this broad definition has been published over the past 25 years. Importantly, a great deal is already known about the effective design of synchronous and asynchronous online learning environments, as reported in several major literature reviews (Means *et al.* 2010; Siemens, Gasevic and Dawson 2015; Martin, Sun and Westine 2020). In a similar vein, a body of scholarly literature explores major trends and patterns in online learning. For example, past, present, and future trends are revealed in the annual Horizon Report (Educause 2021) and Innovating Pedagogy Report (Kukulska-Hulme *et al.* 2021). Additionally, retrospective analyses of trends exist, such as Bozkurt and Zawacki-Richter's (2021) powerful visual representation of the online [distance] learning landscape. And more popular opinion pieces and speculative commentaries on future trends from both educators and the EdTech sector also make up the literature.

3. Five major trends

The discussion now gives attention to five macro-level trends in the evolution and future development of online learning. Set against the drivers and attractors underlying these trends, the question of how we choose to shape, reshape, and reimagine future ways that online learning is deployed in the ser-

vice of education, lifelong learning and the types of digital societies we want to create is open to conjecture. This raises a much bigger question that needs to frame any serious discussion of trends. After all, our possible, probable, and preferred futures for online learning are inextricably linked to broader ideas about what constitutes a «good society» (Brown 2016).

Convergence – Learning at the intersections

The trend of «Convergence» has already been noted in the above discussion concerning the blurring of modalities. The term «modality» usually refers to the physical location and timing of teaching and learning interactions. The shift away from a simple face-to-face/online binary has muddied the waters (Irvine 2020), with Gourlay (2021, 57) arguing that «[...] the notion of 'virtual learning' is a flawed one». In explaining the embodied and increasingly entangled relationship we have with technology from a socio-material perspective, she argues that learning is always in person, even when studying alone at home in front of a screen (Gourlay 2021). Thus, online learning is more complex than most people appreciate and not a single monolith as it encompasses many different forms. Accordingly, there is a great deal more to online learning than the practice of Emergency Remote Teaching (Hodges *et al.* 2020) that emerged in 2020 in response to the Covid-19 crisis.

Another way to think about Convergence is to consider the places and spaces where learning can occur. As Figure 1 illustrates, in today's new digital learning ecology, learners can now learn on-campus in formal classroom settings, on-campus within informal out-of-class contexts, off-campus within formal in-class settings, and off-campus within informal beyond class contexts (Brown 2015). This representative of online learning suggests increasing leakage across these four quadrants. While it remains to be seen whether «off-campus formal learning» will become more common, there is a growing call to reconceptualise the learning environment to include learners' «[...] real-world spaces and their socio-cultural surroundings through a post-digital paradigm» (Wardak *et al.* 2021, 1). Put more simply, online learning can help to bring the real-world into the classroom. While one could speculate this paradigm shift may be a legacy of the pandemic, the reality is that online learning makes up less than 2% of the current global higher education degree market (HolonIQ 2020a).
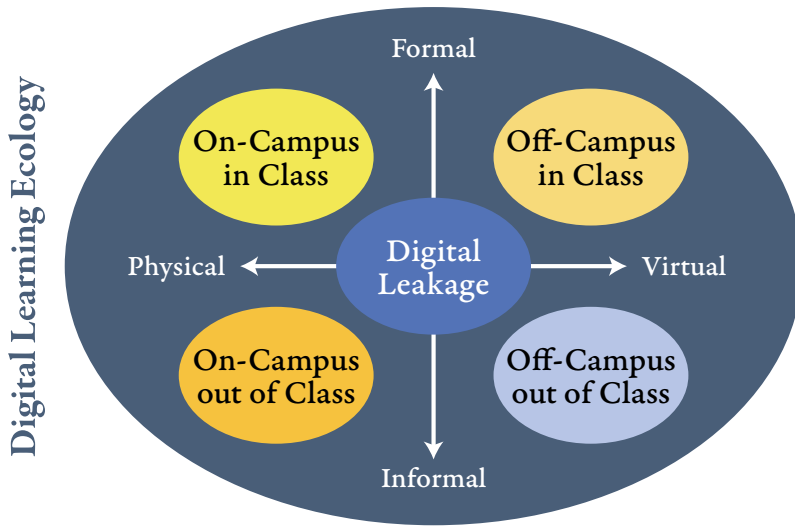
Fɪɢ. 1. The Digital learning ecology.
    Source: (Brown 2015).

Since the start of the pandemic, «blended» and «hybrid» learning concepts have attracted renewed interest. However, both terms lack a common definition. At its simplest, blended learning is often seen as: «[...] The use of traditional classroom teaching methods together with the use of online learning for the same students studying the same content in the same course» (Cleveland-Innes and Wilton 2018, 2).

This type of definition is often criticised as it lacks an underlying pedagogy and transformative ambition. The idea of blending does not by itself suggest a distinctively better approach. While Irvine (2020) notes the two terms have been synonyms for decades, the latter concept of hybrid learning has received greater attention following the Covid-19 crisis. Although still lacking a shared definition, hybrid learning borrows from the field of horticulture and the idea of intentionally grafting together the best attributes of different plant varieties to cultivate something that is better. This is an important distinction as blended learning tends to focus on just mixing different delivery modes. Since the pandemic, this distinction has become more apparent with terms such as «hybrid», «hybridity» and «hybridization» being more carefully conceptualised in the context of new models of lifelong learning (Norgard 2021). According to Norgard (2021, 4), we need to leave:

> [...] dichotomies such as onsite-online, physical-digital or synchronous asynchronous learning behind and view learning technologies, tools and contexts as

hybrid partners in lifelong learning by way of designing for post-digital hybrid learning practices and environments.

On a more practical note, Butler *et al.* (2017) provide a tangible example of the convergence between different modalities in the context of a hybrid model of teacher professional learning. In addressing the dual problems of transfer and scalability, they build on Laurillard's (2016, 1) claim that «Mooc pedagogy fits well with the combination of instruction and peer community learning found in most professional development». More specifically, Butler *et al.* (2019) illustrate how teacher professional learning can be augmented through a hybrid model that incorporates Moocs to promote critical reflection and deep pedagogical conversations, providing educators opportunities to share ideas and resources to foster co-learning. As Parsons, *et al.* (2019) observe, learning online supports a more fluid approach to professional development. An underlying assumption of the emergence of more hybrid models is that one-off traditional approaches to professional development do not work in transforming pedagogy. And online teacher communities «[...] can be a valuable means of developing supportive and collegial professional practices» (Lantz-Andersson *et al.* 2018, 302).

This assumption is confirmed in a recent literature review reporting how online spaces provide multifaceted opportunities for teacher's learning and critical reflection, which blur traditional boundaries between formal and informal professional development (Beach *et al.* 2021). However, the increased blurring of modalities should not be confused with homogeneity. Another basic assumption of a well-designed hybrid approach is that one-size models of learning will not fit all. This assumption is confirmed in a recent literature review reporting how online spaces provide multifaceted opportunities for teachers' learning and critical reflection (Beach *et al.* 2021). To put it another way, in the context of teachers' professional learning, different folks may need different strokes depending on their needs and educational settings (Butler *et al.* 2017). This assumption extends more widely to the design of online learning environments for students where a hybrid approach involves cultivating the best features and characteristics for the conditions.

Massification – The supersizing of learning

A second important trend is «Massification» or the development of massive pedagogy. This term refers to education being delivered or experienced at a mass scale (Brown 2016). Typically, the Mooc movement is viewed as the catalyst of mass online participation, but large social and personal learning networks existed well before the Mooc. While the level of attention given to

the Mooc by popular media may have faded in recent years, the phenomenon continues to evolve and challenge traditional models of instruction, including those designed specifically for online distance education. In particular, the Mooc challenges assumptions about optimal class size and the teacher's ability to manage large cohorts of learners.

Massification is not without well-documented problems in terms of low completion rates, but most critiques fail to recognise or encapsulate the many faces of Moocs. It is naïve to think that all Moocs are the same. Additionally, the Mooc movement has challenged our traditional conception of course completion (Maartje *et al.* 2017) and given new insights into online learning barriers (Rabin 2020). Independent of the claimed under-evidenced benefits or exaggerated promises, Moocs should no longer be viewed as lingering on the fringes of education. As Shah (2021) reports:

> Ten years ago, over 3000 learners were taking the 3 free Stanford courses that kicked off the modern Mooc movement. I was one of those learners. Now, a decade later, Moocs have reached 220 million learners, excluding China. In 2021, providers launched over 3100 courses and 500 microcredentials. In 2021, 40 million new learners signed up for at least one Mooc, compared to 60 million (fuelled by the pandemic) in 2020.

 During the early period of the Covid-19 crisis, Moocs attracted almost 500 million visits from learners worldwide in the 30 days before June 2020, up 2.5 times in January 2020 (HolonIQ 2020b). While the Mooc movement is associated with the increasing unbundling, disaggregation, globalisation, marketisation and monetisation of higher education (Morris *et al.* 2020), not all online learning platforms or partnerships are created equal. Thus, sweeping generalisations of the Mooc are unhelpful. Moreover, the reality is that the Mooc is now a permanent feature of the global education and training landscape, especially as demand continues to grow for flexible models of continuous professional development (Matkin 2021). Even before the pandemic, Gallagher (2021) reports that about half of all corporate learning in the United States was being delivered in an online mode, this figure has increased significantly over the past 2-years.

Current micro-credentialing initiatives designed to help increase participation in lifelong learning and enhance employability are evidence of how massification is redefining old recognition and credential models (Brown *et al.* 2021). The reshaping of the traditional credential ecology is likely to continue, with Google, for example, recently launching, in partnership with Coursera, 1,000 free scholarships for online study for Dublin jobseekers (O'Dea 2021). Also, in Ireland, a major national micro-credentialing initiative is underway

being led by the Irish universities association (Iua). With a budget of over €12 million, this initiative is further evidence of the drive to expand the traditional outreach of universities in response to new online delivery models.

Bozkurt, Akgün-Özbek, and Zawacki-Richter (2017, p. 131) describe the gradual mainstreaming of Moocs in terms of a shift from «[...] disruptive to a sustaining innovation». Evidence of this shift is Coursera's listing in 2021 as a publicly listed company offering «[...] 30 degrees and 5,000 courses from 241 industry and university partners» (Matkin 2021, 2). While the Mooc phenomenon is here to stay, a new area of future growth and innovation may be in schooling education. A recent literature review suggests increasing use of Mooc platforms by teachers and younger learners (Koutsakas *et al.* 2020). According to Matkin (2021), the trend toward higher scale operations, or what he calls «The Big Box Store», is further highlighted by edX's recent acquisition by 2U along with growth in the number of Online program managers (Opms). The key point is that learning at scale through new online pathways and platforms will continue to be an important trend. It follows that educational policymakers would be wise to engage more with the Mooc movement as new private-public partnerships challenge traditional business models.

Openness – When pedagogy meets politics

The «Openness» movement is another major trend set to continue to play a role in shaping the future of online education. The concept of Openness has many dimensions and sits within a broad spectrum of open initiatives (Conole and Brown 2018). Weller *et al.* (2018) suggest several principles associated with open practices, including: freedom to reuse, open access, free cost, easy use, digital/networked content, social/community-based approaches, ethical arguments for openness, and openness as an efficient model. Consistent with these principles, the following statement from the 2012 Paris Oer Declaration is often cited as one of the touchstone definitions:

> Open educational resources (Oer) are teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions (Unesco 2012).

While open education is not a new term and has attracted research interest for over 30 years (Zawacki-Richter *et al.* 2020), it continues to evolve and covers a range of philosophies and practices. According to Zawacki-Richter *et al.* (2020, 321), «Throughout history, openness has been given many meanings: access, flexibility, equity, collaboration, agency, democratisation,

social justice, transparency, and removing barriers». They argue that openness is a living idea that continues to evolve and has become associated with many more meanings and interpretations. At an ideological level, openness is associated with promoting equity and social justice and the assumption that education through the internet can help to fix social disparities (Almeida 2017). From this perspective, Oer can act as a «social transformer» (Knox 2013). However, Farrell *et al.* (2021) challenge some of the altruistic, philanthropic and public good drivers underlying the Oer movement in arguing that it needs to better align with the actual problems educators and learners face in today's rapidly changing educational landscape.

According to Almeida (2017), nevertheless, it is hard to overstate how much the openness movement has dominated recent conversations about the future of education. A recent bibliometric mapping analysis of research papers on Open educational practices (Oep) in the Web of Science and Scopus databases identified over 600 studies (Tlili *et al.* 2021). While the subtle shift in focus to «practices» rather than resources helps to move the field beyond altruistic thinking and undertheorised rhetoric the level of Oer uptake remains patchy and is often limited to a small number of evangelists. In 2015, a European survey found that Open Education was not a big issue for around half of the responding higher education institutions (Castaño Muñoz 2016).

More recently, a Us study found that use of Oers as required course material during the Covid-19 crisis did not increase (Seaman and Seaman 2021). On a positive note, the majority of responding faculty self-report at least some level of awareness of the term Oer for the second year. This result continues a trend of increasing awareness of Oers over the previous five years. Importantly, faculty who are aware of one or more Oer initiatives were found to be much more likely to be Oer adopters. Many educators worldwide participated in free online courses and professional development webinars during the Covid-19 crisis, as reported by Eden (2021), Iua (Flynn *et al.* 2021) and others, may have increased the level of Oer awareness. Although speculative, the high level of interest in these open professional learning events is a positive legacy of the pandemic, which may, in turn, feed greater demand for open, online exchange platforms. The openness movement, however, is still characterised by an overemphasis on the supply-side as opposed to a better understanding of how to build the demand-side of teachers' professional learning and development.

Another positive development is how the integration of emerging technologies such as Artificial intelligence (Ai) and educational data mining algorithms could help to increase and enhance the use of Oer for teaching, learning and assessment. In presenting a future vision, Tlili *et al.* (2020) discuss the potential of these solutions in addressing the problem of locating and selecting

the most appropriate Oers among the many thousands, if not millions, that are published and that are available online, and trusting them. However, Lee (2021), in a recent critique of the relationship between openness and innovation, challenges through a case study of Athabasca University the assumption that there is alignment between the aspiration of being fully open to diverse student groups and being technologically innovative. This study underscores that the value of openness, and the use of Oers more specifically, depends not on the digital resource itself, but rather on how teachers appropriate them in their educational practices.

While the term Oep lacks a clear definition, it signals the need for a more wide-ranging remit (Weller *et al.* 2018). In a similar vein, the concept of «Open Pedagogy» has grown in popularity as it gives greater attention to the mediating role of the social, cultural and educational context. Once again, however, there is no agreed-upon definition of what this term means, as shown in a recent literature review (Tietjen and Asino 2021). In recognising that openness is a complex phenomenon, Cronin (2017) suggests that for educators to grasp Oeps they need to be considered at four different levels: nano, micro, meso and macro. At the macro-level, Conole and Brown (2018) argue that the meaning of openness is influenced by several competing and co-existing drivers. On the one hand, open education provides a real opportunity to reduce costs, enhance quality and address increasing global demand for higher education.

On the other hand, the openness movement is imbued in the contested terrain of globalisation, fast capitalism and neo-liberalism (Brown 2016). The discourse of openness simultaneously supports the democratising of learning at the same time as a more laisse fare Silicon Valley narrative (Brown 2016). Thus, openness could mean virtually anything (Weller 2014) and is potentially a two-headed monster. Almeida (2017) writes that openness may propagate a two-tiered educational system under the guise of so-called liberation, reinforcing a neo-liberal formulation of education that precludes social change. The key point is that Oer may help widen access to learning opportunities, but they cannot solve more profound structural inequities. Additionally, they should not become a substitute for «[...] a well-funded public education system» (Bates 2015; cited in Almeida 2017, 5).

A recent critical text exploring «Open at the Margins» (Bali *et al.* 2020) recognises that open education is at a critical juncture, having been infiltrated to some extent by corporate interests. In looking to the future, an important call is made for more open dialogue and critical pluriversalism to avoid the watering down of the ideological roots of openness (Bali *et al.* 2020). To this end, the current European-funded Encore+ project (Icde 2021) is notable for

the way it seeks to engage different stakeholders to support the uptake and innovation of Oer for both education and business. Whether the two different worlds can co-exist and work together for the same end goals of a more equitable society remains to be seen, but a key question yet to be resolved is around sustainable Oer business models. A related question for the future is whether the appropriation of the language of openness by traditionally closed institutions and elite universities will fundamentally challenge their privileged status. Thus, the concept of hegemony—in which dominant groups in society seek to establish the common sense, define what counts as legitimate areas of agreement and disagreement, and shape the political agendas made public—is central to fully understanding the Openness movement (Brown 2016).

Interactivity – Learning by design

«Interactivity» is well-established as essential for active and meaningful online learning (Picciano 2017). Interaction has long been a defining and critical component of the learning process. In the context of online distance education, Moore (1989) was the first to propose three types of interaction that Anderson (2003) later encapsulated in the «Interaction equivalency theorem». This seminal theorem continues to define the core parameters of interactivity and how online learning can be used to create rich learning and knowledge building communities. At a basic level, Anderson (2003) describes three common types or dyads of interaction involving learners: learner-learner; learner-teacher; learner-content. Over the years, several other dimensions of interactivity have been added to the original model, including teacher-teacher, teacher-content, and learner-administrator. A key assumption underpinning the theory is that «deep and meaningful formal learning is supported as long as one of the three forms of interactions is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience» (Anderson 2003, 4).

However, frequency of interaction by itself does not equate to better quality learning experiences. There are important qualitative differences in the value and quality of interaction. The key point is that the mere presence of new digital technology does little to increase online interactivity or support more fundamental changes to the formal spaces within which people learn (Brown 2015).

The concept of presence is central to arguably the most well-known and extensively researched model for online learning known as the Community of Inquiry Framework (Garrison *et al.* 2000). While many critiques and model variations have been proposed over the past 20-years (see for example,

Rourke and Kanuka 2009; Swan and Ice 2010; Zawacki-Richter *et al.* 2017; Castellanos-Reyes 2020), essentially there are three interdependent structural elements of the framework: Cognitive, Social and Teacher presence.

Cognitive presence describes the progressive phases of practical inquiry leading to the resolution of a problem or dilemma (Akyol and Garrison 2011). More simply put, it involves academic content and engaging the mind in the online learning environment.

Social presence is «[...] generally considered to be the ability of the individual learner to project themselves as a 'real' person in the online environment» (Farrell *et al.* 2021, 48), although Oztok and Kehrwald (2017) identify four different interpretations of the term in the literature.

Teacher presence refers to the design, facilitation, and direction of cognitive and social processes to realize personally meaningful and educationally worthwhile learning outcomes (Akyol *et al.* 2009). More specifically, teaching presence is theorised to include three sub-elements: (a) facilitation of discourse, (b) direct instruction, and (c) instructional design and organisation (Fiock *et al.* 2021).

The educational experience occurs at the intersection of these presences. While the mix may vary depending on the context, all three presences are believed to be required for effective online learning to occur. While Lewin (1952,169) claims that «there is nothing more practical than a good theory», and Shearer (2021) explains why our theories matter in response to the Covid-19 crisis, there is a tendency of reifying the Community of Inquiry Framework without giving due consideration to numerous critiques and model variations. It should also be noted that the presences have not been as well applied or researched in school education yet (Brown *et al.* 2019).

While the Covid-19 crisis may have ignored some well-established theories developed over several decades, including Laurillard's (2002) seminal Conversational Theory, it has also spurred new lines of theorising. The concepts of «Learner presence» and «Emotion presence». have attracted greater attention in promoting interactivity, student engagement and a sense of belonging and community (Henritius *et al.* 2019; Jiang and Koo 2020; Hong, and Samon 2021; Nkomo *et al.* 2021). Moreover, a new focus on the «Pedagogy of care» (Bali 2015) is another dimension of how the pandemic has influenced our traditional conceptions of interactivity. Drawing on seminal work published almost 20-years ago, Moorhouse and Tiet (2021, 211) claim: «To enact a pedagogy of care, there must be a desire to care from the teacher, a deep understanding of the needs of the cared for, and an acknowledgement of the act of caring provided and a want to be cared for by the learners».

In our work, the importance of caring for learners and giving greater attention to their emotions during the pandemic was explicitly addressed in a free online course, A Digital Edge: Essentials for the Online Learner. This course was launched in September 2020 through the FutureLearn platform and has attracted over 10,000 learners, with more than a 50% completion rate. Notably, the course is co-facilitated by students and anchored in an adapted version of the «LifeComp Framework» (Sala *et al.* 2020) which places a strong emphasis on empathy and wellbeing (see Figure 2). Another strong emphasis is the assumption that learning how to learn online is now an essential life skill (Beirne *et al.* 2021).
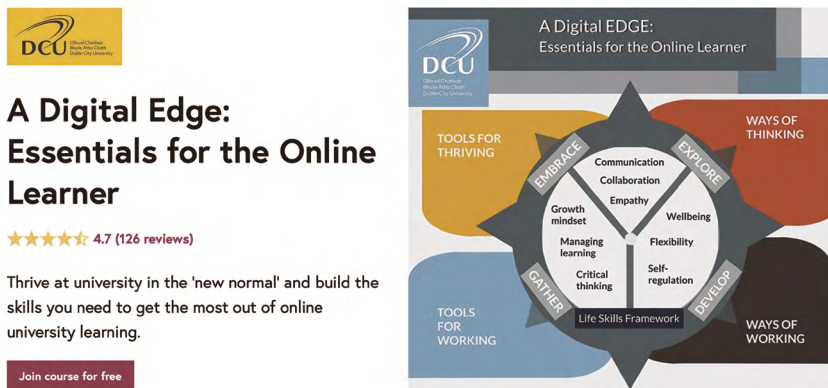

FIG. 2. Free online course on learning how to learn online.

While new digital technologies offer affordances to border cross presences and expand conceptions of interactivity, how they are enacted in practice depends on how teachers and learners choose to interact. Importantly, teachers' pedagogical decisions and how students decide to engage in different learning experiences can lead to different outcomes through the same technology. It is abundantly clear that teachers' pre-existing pedagogical beliefs play a crucial role in mediating practice (Tondeur *et al.* 2017; Lawrence and Tar 2018; Fernndez-Batanero *et al.* 2020). Therefore, whether an experience is active or passive within and across these theoretical domains is strongly dependent on the pedagogy being applied, learners' goals, motivations and prior experiences, and the wider culture of learning.

Historically, the study of interaction in online and distance education contexts has tended to focus on asynchronous communication, which offers a flexible pace for learning (Butler *et al.* 2020). The term asynchronous learning refers to delayed communication, not live or happening at the same time (Ir-

vine 2020). The early literature reports how online discussion through email or web-based technologies could provide valuable learning opportunities where people can critically reflect and respond. More recently, Lms and Mooc platforms have tended to rely on asynchronous forms of interactivity through the act of online discussion where people communicate, share and exchange information at a time of their convenience. Siemens, Gasevic and Dawson (2015, 44) confirm the observation in their major literature review that «Asynchronous forms of distance education received much more attention than synchronous or mixed modes of education delivery». Thus, prior to the Covid-19 crisis, as evidenced by a comprehensive guide for fostering asynchronous online discussion (Verenikina *et al.* 2017), this form of interactivity was essentially the foundation of most online learning.

Another feature of asynchronous learning is interactivity with the content. While content can take many different forms, from static to dynamic resources, the emergence of rich media, specifically video, offers an exciting area of development. The Covid-19 crisis appears to have accelerated demand for video content, and there is an increasing body of research seeking to understand how best to deploy this technology in the service of active and meaningful learning (West *et al.* 2017; Chorianopoulos 2018; Mayer *et al.* 2020). While there is more than 30-years of research on the use of video in education, in synthesising the more recent literature, Mayer, Fiorella and Stull (2020, 837) conclude:

> People learn better from an instructional video when the onscreen instructor draws graphics on the board while lecturing (dynamic drawing principle), the onscreen instructor shifts eye gaze between the audience and the board while lecturing (gaze guidance principle), the lesson contains prompts to engage in summarizing or explaining the material (generative activity principle), a demonstration is filmed from a first-person perspective (perspective principle), or subtitles are added to a narrated video that contains speech in the learner's second language (subtitle principle).

A recent survey of nearly 50,000 Irish students across 25 colleges and universities found that recorded lectures were the single most dominant positive element of the Covid-19 online learning experience they want to retain when on-campus studies resume (Irish Survey of Student Engagement 2021). This finding is mirrored in an innovative crowdsourced «Your Education, Your Voice, Your Vision» campaign where students were asked from April to May 2021 through social media to provide an insight into how they see their ideal education experience going forward (Iua 2021). In response to the question, «In an ideal world which of the two scenarios would work best for you», 61% of respondents reported lectures online, tutorials on campus (Iua 2021).

Other future applications of rich media learning include the use of video for more authentic assessment and feedback. While adding the use of video to existing teaching has been shown in a recent literature review to lead to strong learning benefits (Noetel *et al.* 2021), the question remains whether more engaging applications will in the future replace the traditional concept of «lecture capture». Such traditional use of video for teaching by its very design usually adopts a transmission model of pedagogy, where the learner is a relatively passive recipient of digital content.

In contrast to the wealth of asynchronous literature, before the Covid-19 crisis, there were relatively few dedicated resources on the application of synchronous interactivity in online learning environments. One notable exception was the handbook produced in Australia on the potential of blended synchronous learning (Bower *et al.* 2014). A recent systematic review of two decades (1995 to 2014) of research on synchronous online learning confirms the relative dearth of literature as no research articles were found to be published before the year 2000. However, the study did identify over 150 publications since this date, but much of the research lacked granularity and tended to focus on attitudes and perceptions (Martin *et al.* 2017).

The pivot to Emergency Remote Teaching appears to have resulted in a significant uptake of synchronous interaction as regularly scheduled face-to-face classes were replaced by live online lectures and tutorials. Paradoxically, the move to synchronous online delivery augmented by the development of new online platforms such as Teams and Zoom typically reduces the flexibility of online learning. In problematising the concept of flexibility and the language of «anytime anyplace» learning, Houlden and Veletsianos (2019, 1006) argue that some students benefit more than others and «[...] flexible designs should account for individual and environmental circumstances». According to Hodges, *et al.* (2020), the adoption of synchronous tools may not have been the best choice under the circumstances. At the time of this observation, Hodges *et al.* (2020) were aware of the tendency for live synchronous delivery to be overly teacher-directed, with often few meaningful opportunities for interaction between teachers and learners and between learners and fellow learners.

There is now renewed interest in how to facilitate and promote deep discussions using synchronous online learning tools. While still an emerging research area, a recent systematic literature review conducted by Raes *et al.* (2020) identifies many important gaps in the literature on what they call synchronous hybrid learning. The authors conclude that «[...] existing research suggests cautious optimism about synchronous hybrid learning which creates a

more flexible, engaging learning environment compared to fully online or fully on-site instruction» (Raes *et al.* 2020, 269).

Significantly, new wearable technologies are rapidly emerging for more immersive synchronous learning made possible by developments in Augmented reality (Ar), Extended reality (Xr) and Mixed reality (Mr). We have already experimented with the potential of these technologies through the new Eciu University Xr Campus (Eciu 2021) and Virtual reality leadership lab (Dcu 2021). Such developments challenge the conceptual definition of what constitutes an interactive learning environment (Hamilton *et al.* 2021) and offer «[...] the possibility for learners to have first-hand experiences that would not be possible in the real world» (Natale *et al.* 2020, p. 2006). Accordingly, these technologies are likely to be one of the most exciting new trends in online learning over the next 1-5 years.

Yet, Raes *et al.* (2020) also identify several pedagogical and technological challenges. More sophisticated technology does not always mesh well with the classroom. There are also quality issues to consider and a renewed focus on Universal design for learning (Udl), although this rapidly growing area of interest still lacks a solid research base (Murphy 2021). While new developments in the design of immersive synchronous tools and online platforms potentially create more opportunities for authentic, engaging, and seamless forms of interactivity, they do not guarantee active and meaningful learning. Understanding of how to design and lead rich discussions using these platforms will be paramount towards promoting meaningful live interaction. Such interactions will continue to rely heavily on educators' skill, knowledge, and pedagogical competence to design quality conversations where learners engage in deep knowledge construction. The key lesson for the future of online learning is that rich forms of interactivity happen by design and require careful scaffolding and active facilitation by educators.

Diversification – Learning on the edge of innovation

«Diversification» of digital tools and technologies and the associated growth of demand for online learning is another increasing trend likely to continue. In his keynote presentation back in November 2019 at the Icde World Conference on Online learning, Simon Nelson, previous Ceo of FutureLearn observed that «The global market for online education is still very much in its infancy». Few could have predicted the «great onlining» of education in 2020 (Bozkart *et al.* 2020) and the impact this would have on schools, colleges, universities, and the EdTech industry. As a result, there is an ever-increasing variety and diversity of online learning solutions available to today's educators.

On the other hand, the Lms/Vle continues to play a core role at most higher education institutions, despite predictions of its death (Farrelly *et al.* 2020). This role is unlikely to be replaced in the foreseeable future, but as the diversity of digital tools has grown, the online learning environment is increasingly viewed as a complex ecosystem of interconnected technologies. As this ecosystem becomes more complex, more specialist and distributed knowledge is needed. No one individual or institution can keep up to date with the pace and diversity of new developments without being more widely connected. Ecologically speaking, rather than focusing primarily on core proprietary technology, embracing this greater diversity is crucial to building resilience and adaptability to future shocks or more gradual changes to the learning environment (Weller and Anderson 2013). From a post-digital perspective, Ryberg *et al.* (2021) illustrate through the notion of ecotones, a concept borrowed from ecology describing transitional areas of vegetation, such as forest and grassland, how they often support diversity and richness as well as species not found in overlapping communities. The lesson from this line of theorising is that diversity at the edge provides valuable breeding grounds for cultivating learning innovation and reimagination (Ryberg *et al.* 2021).

The opportunity to explore these overlapping boundaries and develop specialist knowledge across the ecosystem is partly supported by open-source applications with strong global communities. It is noteworthy how many online learning technologies are free and openly available, as Bower and Torrington (2020) illustrate in a typology of tools. They identify and map 226 free web-based tools arranged into 40 types and 15 clusters. Building on this latest dataset and the list of open tools and technologies published in 2015 (Bower 2015), the analysis provides an interesting gauge on trends in online learning over the last five years. The authors extrapolate the following implications:

> Firstly, we would expect that smaller tools without a significant differentiation or business case will either discontinue, marketize, or be taken over. Secondly, it would appear that larger players in the online technology ecosystem will continue to crowd-out smaller players, as their suites of tools become more ubiquitous and integrate greater functionality. We can expect that the built-in intelligence of tools will continue to increase as the machine learning and learning analytics fields become more mature (Bower and Torrington 2020, 14).

The trend towards larger players squeezing out smaller innovators is not an entirely new phenomenon, and this could be accelerated by growing concerns about data protection and cybersecurity. However, influenced by the rewilding movement, which seeks to retain ecological diversity in the natural environment, there is a small yet growing call by some educators for the resto-

ration of a less managed ecosystem. Rewilding in an educational technology context is an endeavour to ensure that a more diverse ecosystem can develop so that all can have space or a habitat. As Weller (2022) writes, the aim is to develop a more sustainable, diverse system, which better reflects the broader environment outside of formal education. This more organic bottom-up approach to online learning advocates greater local pedagogic experimentation by adopting small scale, low impact tools that make it as easy as possible to innovate without becoming an institution-wide technology. An example of this is the Splot website (https://splot.ca), which promotes the Smallest/Simplest, possible/practical, latest/lightest, open/online, tool/technology. The Splot initiative is anchored in Norman's (2013) «Law of eLearning tool convergence», which states: «Any eLearning tool, no matter how openly designed, will eventually become indistinguishable from a Learning Management System once a threshold of supported use-cases has been reached».

It is noteworthy that students already choose a diverse range of digital technologies to support their learning beyond those provided by institutions. For example, a major Irish National Digital Experience survey of 32 higher education institutions conducted in October 2019 found an interesting gap in the type and number of digital tools used between staff and students (National Forum 2021). When students were asked to give an example of a digital tool or app they found really useful for learning, over 600 unique tools and apps were identified demonstrating the wide range of technologies students use to support their learning. In contrast, when staff who teach were asked to give an example of a digital tool or app they found really useful in their job role, they identified around 300 different tools. The National Index survey attracted over 25,000 students and almost 4500 staff responses.

In the future, arguably, the interoperability between them is probably more important than the number of digital tools available for teaching and learning. Importantly, the term «interoperability» is used here to indicate both technical and conceptual alignment between different tools and platforms. The latter refers to how tools are understood and viewed or positioned in the ecosystem. As the digital ecosystem becomes more complex, even more strategic partnerships are likely to emerge between institutions and industry suppliers to provide a more integrated online learning experience. Some of the larger Mooc platforms are already changing their business models to integrate with other It systems to better support credit-bearing micro-learning experiences. Over the next few years, several new online learning platforms are likely to emerge that have affordances so rich and compelling it will be hard to ignore their potential. The above wearable and immersive learning technologies are likely to fall into this category along with new developments in Artificial Intel-

ligence (Cox 2021) and Virtual Laboratories (Reeves and Crippen 2021). On a related note, learners will become more mobile as smart devices and hearable technologies become more commonplace in educational settings (McGreal 2018).

However, new digital solutions can be impactful and even transformative without being functionally rich. They may simply challenge current business models. For example, in the future, some institutions may choose to outsource student support services such as maths tutoring, writing development, and health and wellbeing counselling on a 24/7 online basis to improve the learning experience. Further developments in adaptive technologies and learning analytics are likely to help personalise some of these services to students at the point of need. This example only touches on the potential of learning analytics. There are many other emerging areas such as hackathons, escape rooms, gamification, and online assessment, to name a few, that are highly likely to influence the future of online learning. While there is insufficient space to cover these innovations, they all share a common question. As Zawacki-Richter *et al.* (2019) ask in their systematic literature review of research on Artificial Intelligence in education: where are the educators? Educators and learners must have a strong voice in making and shaping the increasingly diverse online learning ecosystem.

4. Conclusion

This bigger picture helicopter analysis has shown how online learning has many different shapes, reflected in five macro-level trends likely to influence future developments. The trend analysis underscores the point that online learning must be understood in the context of wider societal change forces. This point is further illustrated by two additional trends this paper leaves for another discussion: the rise of «Big EdTech» (Teräs *et al.* 2020) and growing concerns about digital technology's environmental footprint and the need for «Green EdTech» (Selwyn 2021). The addition of these trends, and others that we have failed to highlight or identify, reinforces why the conception of good online pedagogy needs to extend beyond the classroom to the wider politics of digital education. While the digital education ecosystem is simultaneously converging, getting larger in scale, more open and closed, and is growing in diversity, a problem remains in terms of access to the Internet. The reality is that if students do not have access to the Internet, then online learning in whatever format is problematic and unlikely to advance the goals of equity, inclusion, and social justice. At the risk of sounding technocentric, the analysis

also reveals that the choice of specific tools and platforms for online learning matters. Not all platforms confer the same pedagogical affordances. Also, there is a crucial tension between large propriety systems and smaller tools operating on the edge of innovation.

By analogy, online learning remains like «running to catch a moving train» (Becker 1998). Before deciding whether to start chasing the train, we need to ask what type of fuel is powering the engine? Moreover, who else is already on the train, and what is their intended destination? What opportunity is there to switch lines and, if necessary, change the timetable? Also, how do educators get to drive the train? These are deeper questions once again highlighting the politics of digital education. The original train analogy first used by Becker (1998) over 20 years ago is still relevant as it reminds us how educators and learners need to continually learn, unlearn and relearn as new online possibilities and opportunities are likely to emerge in post-digital societies.

However, we do not have to stop the train or reinvent the wheel completely. After all, well-developed theoretical frameworks provide a strong foundation for applying new digital technologies for effective online teaching, learning and assessment. Nevertheless, the success of new online learning initiatives depends heavily on educators. With an increasing demand for online learning in response to the Covid-19 crisis, there is a need for more impactful professional development opportunities that challenge teachers' pre-existing pedagogical beliefs and promote a deeper understanding of new digital technologies — for better and worse. Ultimately, the trend analysis reveals that educators' values, mindsets and underlying educational philosophies are key to unlocking the transformative potential of new online learning models. They influence how teachers respond to new learning opportunities and untangle inherent tensions as they navigate through competing change agenda. While the mediating influence of teachers' beliefs is crucial, we cannot underestimate other structural barriers arising from traditional learning cultures and wider socio-political constraints. If we want to challenge these barriers, then educators need a critical multifocal lens with the ability to see different viewpoints and competing images of the future.

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