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What are the Main Trends in Online Learning?
A Helicopter View of Possible Futures

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Abstract: The COVID-19 crisis has given rise to the question, what are the main trends in online learning? What might the future look like? While predicting the future is best left to those who appear to have a crystal ball, the need for big picture helicopter thinking has never been more apparent as online learning remains under the spotlight. This paper responds to this challenge and the tendency to overlook the field's rich history during the pandemic. It establishes that defining online learning is not a straightforward task, and there are widespread differences in using the term. A multifocal perspective is then adopted to identify seven macro-level trends, which help frame the analysis and enable the discussion to zoom in and out 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, along with concerns about the growth, influence and sustainability of the EdTech industry, demonstrate how online learning is part of a wider social practice. Thus, the trend analysis endeavours to balance the language of opportunity with the need for deeper criticality. Woven throughout the paper is the spirit of hope and the crucial role that educators play in helping to shape and reshape possible, probable, and preferred futures.

Keywords: Online learning, major trends, big picture, covid-19, social practice.

Highlights

What is already known about this topic:
- Online learning is under the spotlight.
- There is already a rich history of literature.
- Much of this literature was overlooked during the pandemic.

What this paper contributes:
- Seven macro-level future trends.
- Key tensions and contradictions between major trends.
- The importance of a wide-angle multifocal perspective.
- How online learning is part of a wider digital education ecosystem.
- A reminder that online learning must be seen as part of a wider social practice
- The importance of steering a path between the language of opportunity and the need for deeper criticality.

Implications for theory, practice and/or policy:
- Defining key terms and choice of language is important
- Planning for online learning needs to consider wider social practice.
- The rise of 'Big EdTech' is both an opportunity and threat to the current education system.
- Growing environmental concerns need to be taken seriously in supporting 'Green EdTech'.
- Educators play a crucial role in mediating and shaping how online learning is understood and applied in practice.
- A hopeful spirit with a critical lens is essential to finding ways that online learning can solve real problems and contribute to preferred futures.

Introduction

While the COVID-19 pandemic has been a game-changer for online learning on several levels, the field has a long and rich history. This history and established best practices and theories have not always featured in our response to the pandemic (Shearer, 2021). A recent analysis, for example, illustrates how the pre-existing literature on student readiness for online learning (Joosten & Cusatis, 2020) is largely absent from pandemic-related publications (Brown et al., 2021b). 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 special issue journals with a COVID 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 post-COVID 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 seven macro-level trends:

- Convergence
- Massification
- Openness
- Interactivity
- Diversification
- Big EdTech
- Green EdTech

Each trend is presented with a description of relevant literature. A 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). These images make it tricky to maintain the language of hope and opportunity whilst balancing the need for deeper criticality. It follows that a discussion of future trends is more than just a speculative exercise as it requires problematising the way online learning is couched within a wider social practice.

The Definition Problem

Before setting out to consider major trends in online learning, it does help to define some parameters for the analysis or, at the very least, establish from the outset that defining the field is a challenge. 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), which is better known in Europe as the Virtual Learning Environment (VLE). Since then, online learning has evolved and is a term whose meaning has become less clear over time (Irvine, 2020). As Irvine (2020) 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" (p. 42).

The semantics have become muddied as 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 Johnston (2021) 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" (p. 2).

Therefore, as mentioned above, defining online learning for this analysis is not a straightforward task, with Singh and Thurman (2019) identifying 46 definitions in their recent literature review. Notably, 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 discussion frames 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 & Thurman, 2019).

A wealth of literature falling under this broad definition has been published over the past 25-years. Notably, a great deal is already known about the effective design of synchronous and asynchronous online learning environments, as reported in several major literature reviews (Martin et al., 2020; Means et al., 2010; Siemens et al., 2015). There is a body of scholarly literature exploring major trends and patterns in online learning in a similar vein. 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) interesting 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, which collectively informs this analysis.

The discussion now gives attention to seven 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 service 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 social imaginaries and ideas about what constitutes the '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) even arguing that "…the notion of 'virtual learning" is a flawed one (p. 57). In explaining the embodied and increasingly entangled relationship we have with technology from a socio-material perspective, learning is always in person, even when studying alone at home in front of a screen (Gourlay, 2021). While this perspective is more than semantics the key point is that online learning is complex and not a single monolith as it encompasses many forms, variations, and modifications. Accordingly, more people appear to appreciate 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. However, it is important to recognise that these different spaces are in many ways pedagogy-agnostic, meaning this representation does not address *how* learning takes place. For example, even in traditional 'on-campus in class'

contexts, the pedagogy varies widely, which further underscores why binary comparisons between online and face-to-face learning are problematic.
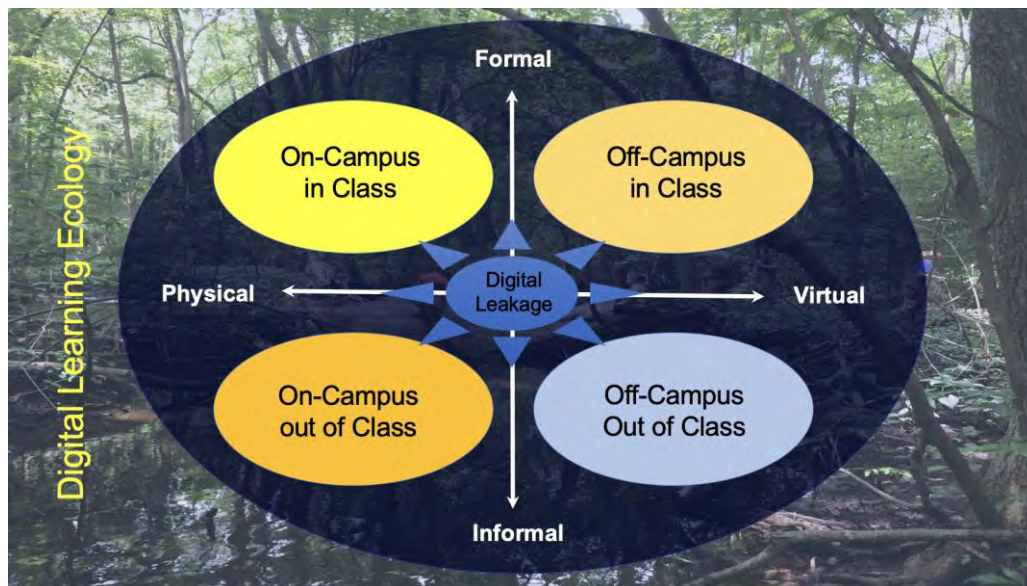

Figure 1. The Digital Learning Ecology (Brown, 2015)

While it remains to be seen whether off-campus formal learning will become part of the next normal, there is a growing call to reconceptualise the learning environment to include learners' "…real-world spaces and their socio-cultural surroundings through a postdigital paradigm" (Wardak et al., 2021, p. 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 significant legacy of the pandemic, the reality is that online learning only makes up less than 2% of the current global higher education degree market (HolonIQ, 2020a).

Notwithstanding this current reality, blended and hybrid learning concepts have attracted renewed interest since the pandemic. While Irvine (2020) notes the two terms have been synonyms for decades, and neither shares a commonly agreed definition, the latter concept has been given more serious consideration in efforts to build back better intentionally. Borrowing from ecology the terms 'hybrid', 'hybridity' and 'hybridization' are being more carefully defined and conceptualised in the context of new models of lifelong learning (Norgard, 2021). According to Norgard (2021), 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" (p. 4).

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) claim that "MOOC pedagogy fits well with the combination of instruction and peer community learning found in most professional development" (p. 1). 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

(Brown et al., 2021a). And online teacher communities '…can be a valuable means of developing supportive and collegial professional practices' (Lantz-Andersson et al., 2018, p. 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 and offer greater 'just-in-time' support (Beach et al., 2021). However, the increased blurring of modalities should not be confused with homogeneity. Another basic assumption of the hybrid approach proposed by Butler et al. (2017) is that a one-size online teacher professional learning model will not fit all. 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). Also, it is important to note that the term 'community of practice' is often used very loosely in teacher education (Henderson, 2015) and a recent literature review shows there is still much to learn about their effective design (Abedini et al., 2021). This point 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 in online learning 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. More to the point, the MOOC movement has challenged our traditional conception of course completion (Maartje et al., 2017) and given new insights into online learning barriers (Rabin et al. 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 300k 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, 40M new learners signed up for at least one
> MOOC, compared to 60M (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 on January 2020 (HolonIQ, 2020b). Notably, during 2020, over 90,000 educators registered for the course *How to Teach Online* that our NIDL team was pleased to support in partnership with the FutureLearn platform (Brown et al., 2021d). This award-winning course was officially launched at the end of March 2020, within only a few weeks of lockdown restrictions in Europe, thus illustrating MOOCs' agility and ability to support mass pedagogy.

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.
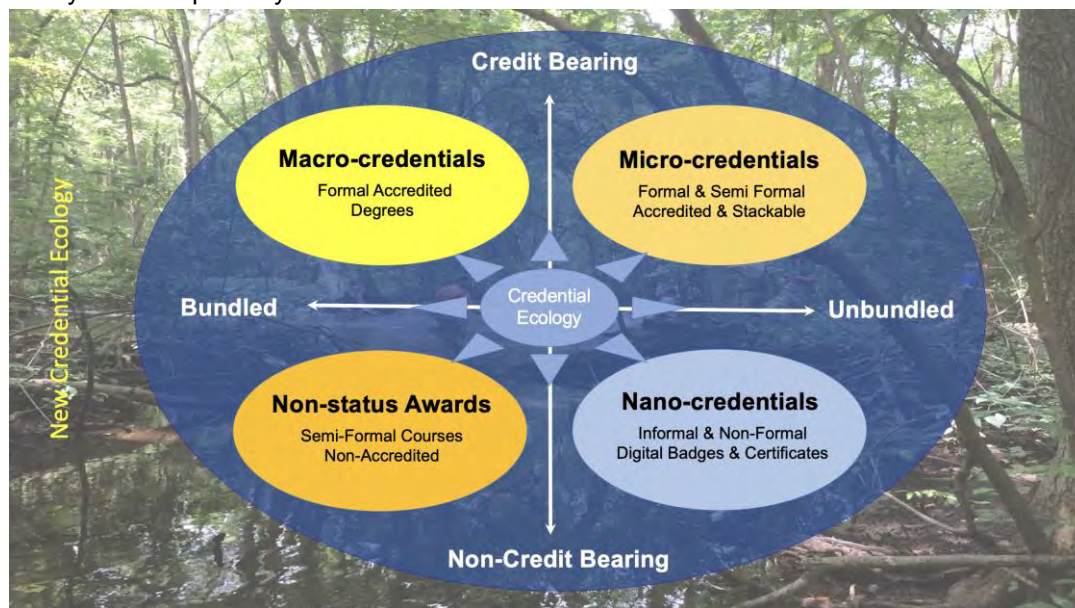

Figure 2. The New Credential Ecology

Current micro-credentialing initiatives designed to help increase participation in lifelong learning and enhance employability in response to the changing nature of work and the need for upskilling are evidence of how massification is helping to redefine old recognition and credential models (Brown et al., 2021c). Figure 2 illustrates how powerful change forces, including the open, online and unbundling movements, are reshaping the traditional credential ecology. This trend is likely to continue with Google 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 €12m, this initiative is further evidence of the drive to expand the traditional outreach of universities in response to new online delivery models.

Bozkurt et al. (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, p. 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 2 U along with growth in the number of Online Program Managers (OPMs) and the emergence of several new mega-universities. 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 & 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), "Throughout history, openness has been given many meanings: access, flexibility, equity, collaboration, agency, democratisation, social justice, transparency, and removing barriers" (p. 321). 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., 2021a). 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 & 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 participating 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. (2020b) 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 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 & 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. 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, p.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 or open washing 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 and inclusive 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 existing business models and privileged societal 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 et al. (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 et al., 2003, p. 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 in 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, Castellanos-Reyes, 2020; Rourke & Kanuka, 2009; Swan & Ice, 2010; Zawacki-Richter et al., 2017), 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 & Garrison, 2011). More simply put, it involves the 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, p. 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, p.169) claims "There is nothing more practical than a good theory", and Shearer (2021) explains why our theories matter in response to the COVID 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 & Koo, 2020; Hong, & 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) 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" (p. 211).

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 3). Another strong emphasis is the assumption that learning how to learn online is now an essential life skill (Beirne et al., 2021).

Figure 3. A Digital Edge free online course

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 & Tar, 2018; Fernandez-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 (Irvine, 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 et al. (2015) 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" (p. 44).

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 (Chorianopoulos, 2018; Mayer et al., 2020; West et al., 2017;). While there is more than 30-years of research on the use of video in education, in synthesising the more recent literature, Mayer et al. (2020) 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)" (p. 837).

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 learners are relatively passive recipients 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) argue that some students benefit more than others and "…flexible designs should account for individual and environmental circumstances" (p. 1006). 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) identify many important gaps in the literature on what they call synchronous hybrid learning. The authors conclude:

> "…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, p. 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 new issues to consider in 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

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 (Bozkurt 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 propriety technology, embracing this greater diversity is crucial to building resilience and adaptability to future shocks or more gradual changes to the learning environment (Weller & 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 & Torrington, 2020, p. 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 restoration 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 Intelligence (Cox, 2021) and Virtual Laboratories (Reeves & 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.

Big EdTech – The new learning economy

While the digital ecosystem has become more diverse, the growth of *Big EdTech* is another significant trend. Even before the pandemic, there were claims that "EdTech is the next Fintech" (Bainbridge, 2017; cited in Shulman, 2017). Importantly, new online education models inhabit the contested terrain of 'marketisation', 'platformisation' and 'commercialisation', which Matkin (2021) encapsulates in the slogan 'Go big or go home'. In many countries, online education delivery often "…involves public universities partnering with, or using the services of, private companies" (Morris et al., 2020, p. 3). The COVID-19 crisis appears to have accelerated this trend, with Teräs et al. (2020) claiming that the pandemic has "…created a sellers' market in ed-tech" (p. 863).

Evidence supports a major boom for the 'EdTech' industry with reports of over \$16 billion (USD) in private equity and venture capital funding in 2020 alone, 32 times higher since 2010 (HolonIQ, 2021). Williamson et al. (2021) argue that a critical characteristic of the educational response during the pandemic has been the growth of new commercial platforms and public-private partnerships promoting the use of EdTech for profitable market returns. There are also growing concerns about the automation of education (Selwyn, Hillman et al., 2021), the rise of platform pedagogies (Perrotta et al., 2021), the surrender of control to surveillance technology (Selwyn, O'Neil et al., 2021), and narratives of policing and punishment (Logan, 2021). These are not trivial matters.

As previously indicated, the rise of 'Big EdTech' is usually associated with powerful neo-liberal forces where proponents argue the unbundling movement is creating a new learning economy (Ralston, 2021). According to this line of critique, higher education is taking the form of a commodity, a product or service, marketed and sold to customers like any other commodity. In challenging the growth of new 'gig qualifications' for the 'gig economy', Wheelahan and Moodie (2021) claim:

> "Rather than presenting new opportunities for social inclusion and access to education, they contribute to the privatisation of education by unbundling the curriculum and blurring the line between public and private provision in higher education" (p.14).

While this is an important line of critique, such sweeping generalisations and one-sided critical images of the future are problematic, especially with limited consideration of the educational context. The hope and the hype of online learning is more muddied as "…the 'outcomes' and 'effects' of technologies in

education are influenced heavily by the local contexts and cultures that these technologies are used in" (Facer & Selwyn, 2021, p. 9). Returning to an earlier point, online learning is not a single uniform entity. However, 'Big EdTech' demonstrates that the online learning movement is part of a wider social practice that requires educators to be 'public intellectuals' (Cochran-Smith, 2006). We have a choice of treating the booming EdTech industry as the enemy or working in collaborative partnerships to find solutions to real educational problems. Where appropriate, rather than being a 'future taker' having limited input into the design of these online solutions, it makes sense to collaborate from the inside to influence the industry's thinking and types of new digital platforms.

Green EdTech – Learning for hopeful futures

The final trend is a move towards *Green EdTech*, which is an umbrella term recognising issues of un-sustainability and environmental costs along with the wider goal of creating a better society for all. This trend is part of a wider social justice movement and growing backlash in some pockets of society against 'fast fashion', 'fast furniture', and 'fast technology'. While the idea of developing low carbon higher education systems is not new, with Roy et al. (2008) claiming over a decade ago that distance learning involves 87% less energy than full-time campus-based courses, Facer and Selwyn (2021) argue, the environmental impacts of EdTech require renewed focus and urgent attention.

On the one hand, they suggest that online learning may be an environmental solution to help lower emissions of students who might otherwise travel to classes and reduce on-campus power consumption. In response to serious economic 'constraint' or climate 'collapse' scenarios, online learning may become the default mode to enable more efficient access to higher education (Educause, 2020). Also, global university networks may be formed to deliver courses through a more sustainable educational model. On the other hand, Facer and Selwyn (2021) point out:

> "At present, however, ambitions for the massively increased global use of online, data-driven and AI technologies in education are dependent on unsustainable levels of energy and natural resource consumption" (p. 15).

They note that this includes the 'dirty' aspects of digital hardware production, the vast energy requirements of data-processing centres and the increasing problem of e-waste. According to Strubell et al. (2019; cited in Facer & Selwyn, 2021, p. 15), "…a typical machine learning model emits the equivalent of around 300,000 kg of carbon dioxide - comparable to the lifetime carbon emissions of five cars". While rising ecological instability does not feature strongly in current future-focused discussions about EdTech, a deeper analysis of the industry's underbelly reveals an 'explosive' environmental footprint. As Selwyn (2021) writes in a seminal publication on this issue, depletion of natural resources, energy curtailments and further planetary degradation may over the next decade "…put paid to established 'abundant' forms of digital technology use" (p. 496). While we need to maintain a hopeful outlook where online learning is part of the solution, the lesson is that efforts to design more equitable, inclusive and sustainable societies with digital technologies need to anticipate 'unknowable futures' (Selwyn, 2021).

Conclusion

This big picture helicopter analysis has shown how online learning has many different shapes, reflected in seven macro-level trends likely to influence future developments. The trend analysis covers much ground and underscores the point that online learning must be understood in the context of wider societal change forces. The conception of good online pedagogy extends beyond the classroom. While the digital education ecosystem is simultaneously converging, getting larger in scale, more open and closed, and is growing in diversity if students do not have access to the Internet, online learning in whatever format is problematic. 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 innovative tools operating on the edge.

Overall, 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 its 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? This original train analogy, which is still relevant after more than two decades, demonstrates that educators and learners will need to continually learn, unlearn and relearn as new online possibilities and opportunities emerge.

However, we do not have to 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 in a wider societal context—for better and worse.

Ultimately, the trend analysis reveals that educators' values, mindsets, theories, and underlying educational philosophies are key to unlocking the transformative potential of new online learning models. They influence how teachers respond to new online learning opportunities, untangle inherent tensions, and navigate competing change agenda. Although the mediating influence of teachers' beliefs has not always been fully appreciated, we cannot underestimate other structural barriers arising from traditional learning cultures and wider system-level constraints. If we want to challenge these barriers and move from COVID-19 fixers to future makers, educators must explore new business models and teaching approaches rather than sit on the side-lines. However, navigating a path between the language of opportunity, set against the need for deeper criticality, is risky work in the face of 'unknowable futures' and requires a multifocal lens with the ability to see different viewpoints and competing images of the future.

Acknowledgments

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