Networked learning in a postdigital-biodigital age

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Abstract

Networked Learning has developed predominantly in university / research settings and communities, yet much of the research across decades can be shown to have implicit links with current popular and much broader global concepts, such as bioinformation, biodigitalism, postdigitalism, and viral modernity. In this paper we explore these implicit connections as an important and perhaps less unrecognized part of Networked Learning. We therefore seek to surface some postdigital-biodigital challenges in Networked Learning by revisiting relevant histories, concepts, and definitions and also noticing where there are parallels and connections, particularly when Networked Learning and Postdigital Science and Education have developed in the same *Zeitgeist*. Despite radically different histories, these areas of research seem to have resulted in different, yet often overlapping theories, research approaches, and ethos. After taking time to look into a number of these cross-cutting areas of interest, we ask the question of why a focus towards postdigital-biodigital challenges in Networked Learning is worthwhile, and indeed, why now? Based on our explorations we perceive Networked Learning to implicitly hold a long history of deep and successful engagement with postdigital-biodigital challenges in theory and through the concept of convergence. The role of convergence is an important and sustained concept in Networked Learning that can help in breaking down perceived barriers to developing cross-cutting research in any of the areas discussed throughout this paper. It is therefore timely to bring to light explicitly such connections, to help us to focus our research efforts on Networked Learning in a postdigital-biodigital age.

Keywords

Networked learning, postdigital, bioinformation, biodigital, convergence, biology, information, society

Introduction

In 2021 the Networked Learning community undertook an important exercise of self-reflection. Early in the year, a group of about a dozen core members of the community wrote the article titled 'Networked Learning: Inviting Redefinition' (Networked Learning Editorial Collective, 2021) and launched an open call for responses. 40 contributors from 6 continents working across many fields of education responded to the call, resulting in the article titled 'Networked Learning in 2021: A Community Definition' (Networked Learning Editorial Collective et al., 2021). This pair of articles revisited, updated, and brought together various understandings of Networked Learning dating from the decades-old landmark definition (Goodyear et al., 2004) to the latest debates in the field (Öztok, 2021).

These articles have attracted considerable attention and have achieved their goal to "stimulate democratic discussion about NL and to prompt some much-needed community-building" (Networked Learning Editorial Collective et al. 2021, p. 327). However, any attempt at defining a wide field or intellectual tradition such as Networked Learning is associated with some challenges. Listing the article at the third place of their Top 10 Journal Articles from 2021, Dublin City University's National Institute for Digital Learning (2022) emphasizes that the articles show "how difficult it is to define the undefinable and how our search for common definitions and to pin down our language can inadvertently narrow thinking and foreclose on different perspectives". We hope that 'Networked Learning in 2021: A Community Definition' (Networked Learning Editorial Collective et al., 2021) has managed to avoid the trap of such narrowing, yet we do not want to ponder that further. Instead,

1

our attention is firmly on opportunities arising from the definition – instead of looking at concepts and ideas well elaborated in the definition, we decided to focus on those that could benefit from further elaboration.

Deeply invested into our current work in the area of bioinformation (Peters, Jandrić, and Hayes, 2022; Jandrić and Ford, 2022), we decided to focus on postdigital-biodigital challenges for Networked Learning. These include implications from new systems biology and digital technologies and a broad "technoscientific convergence that is taking place with biodigital technologies in the postdigital condition" (Peters, Jandrić, and Hayes, 2021b, p. 1). Looking at the definition article, we found that the Networked Learning community takes these questions seriously and offers to

> undertake critical work in promoting connections through ecological learning designs that reflect this new context. … Such contributions would extend the links that NL has established with critical pedagogy and ecologies of learning (Bozkurt, this paper) and 'bring the importance of learning to connect to the fore [i]n order to develop more cohesive and sustainable societies' (Carvalho, this paper). (Networked Learning Editorial Collective et al., 2021, p. 357)

The community further realizes that new biodigital challenges importantly "intersect with NL's focus to social justice and equality" and concludes that "[i]t is therefore time to better theorise the connections between developments in technology, inequality, and education, while also striving to actively design technologies that facilitate more equitable futures for all" (355).

The Networked Learning community has a long history of engagement with biodigitalism. Therefore, it is hardly a surprise that the community definition sees biodigitalism as an intrinsic and important part of Networked Learning. Yet as we will elaborate further in this article, it is also fair to say that a lot of biodigital work in Networked Learning is implicit, rather than explicit. Based on these starting points, this article surfaces some postdigital-biodigital challenges in Networked Learning.

Histories, Concepts, and Definitions

"Networked learning crystallized in the late 1990s by distinguishing itself from developments in digital education that were undermining human connectivity—developments that threatened to reduce education to the production, delivery and consumption of 'content' ('online materials')." (Networked Learning Editorial Collective 2021, p. 315) In one of the first available definitions, David McConnel (1998) wrote: "[n]etworked collaborative learning (NCL) is therefore the bringing together of learners via personal computers linked to the Internet, with a focus on them working as a 'learning community', sharing resources, knowledge, experience and responsibility through reciprocal collaborative learning."

In the same year, Nicholas Negroponte (1998) wrote his famous Wired article 'Beyond Digital' and claimed that "the digital revolution is over. … Its literal form, the technology, is already beginning to be taken for granted, and its connotation will become tomorrow's commercial and cultural compost for new ideas. Like air and drinking water, being digital will be noticed only by its absence, not its presence." Negroponte's article served as a point of departure for Kim Cascone (2000) and Robert Pepperell and Michael Punt (2000) who, independently of each other, published first definitions of the concept of the postdigital in the context of arts. (For a detailed account of this history, see Cascone and Jandrić, 2021.)

Since these early days, Networked Learning has developed predominantly, though not entirely, in university / research settings. Occasionally broader professional networks beyond academia are referenced, but this is a relatively recent development. Since 1998 the biannual Networked Learning Conference serves as a meeting point for researchers in the field, and conference proceedings have published some major related works. 2014 marks publication of the first book in then-new Research in Networked Learning book series, which, publishing approximately one volume per year, has become a major source for Networked Learning research. The postdigital perspective has a very different path of development. It had begun in a wide range of settings such as art exhibitions, popular music, architecture, design, and so on, with an occasional – but far from systematic – academic appearance. Founded in 2018, *Postdigital Science and Education* journal and book series have begun a community effort of synthesizing, systematization, and development of postdigital work as a theory and research approach. This is increasingly recognised across different sectors in the community too (Hayes et al.,

2021) and expanded via authors from industry, business, councils and charities, as well as from academia (Hayes et al., 2022).

Networked Learning and Postdigital Science and Education have developed in the same *Zeitgeist*. Consequently, their radically different histories have resulted in different yet often overlapping theories, research approaches, and ethos. For instance, the Networked Learning community has always been strongly focused on defining the field, culminating in two definitional articles that inspired this paper (Networked Learning Editorial Collective, 2021; Networked Learning Editorial Collective et al., 2021). In opposition, Jandrić and Ford (2020) argue that "one day, probably, our postdigital condition will be condensed in concise encyclopaedia entries and routinely explained by undergraduates. One task is to ensure this does not happen, and that the postdigital remains—for as a long as it is productive—a concept that constantly resists any final definition."

Indeed, as Sian Bayne cautions in her contribution to 'Networked Learning in 2021: A Community Definition', "[t]o define a field is necessarily to put boundaries around it, to determine which writings, conversations, people are 'inside' and which are 'outside' … [t]his is inevitable, and not a reason for choosing not to define" (Networked Learning Editorial Collective et al., 2021, p. 333). As we already mentioned in the Introduction, there are good reasons for and against definitions, and these reasons are well beyond the scope of this paper. For our purpose it is sufficient to say that the recent definitional articles of Networked Learning have inspired writing this article, thus contributing to further development of the field.

This article's topic, bioinformation, has a much longer history than Networked Learning or Postdigital Science and Education. While this history could also easily be a research topic in its own right, we use it to quickly contextualize our research in the field.

For the most part of human history, physics and biology have followed separate development trajectories. In the eighteenth century, for instance, Isaac Newton focused on "a mechanical approach [that] analysed the physical universe as a great machine" and "the dynamical approach [that] concentrated on the mathematical relationship between quantities that could be measured" (Science Encyclopedia 2022). At the same time, Carl Linnaeus developed his taxonomy of living species. In the early twentieth century, physics developed insights into laws governing matter, motion, and energy, resulting in many applications including the development of the computer. At the same time, biology had progressed from its nineteenth-century focus on cells towards molecular biology; a field of study enabled by various tools developed by physics such as X-ray diffraction and electron microscopy. Following the development of computers, sometime in late twentieth century, biology research had become mutually constitutive with information technology.

This brings about the so-called Great Convergence between biology and information, which has three important consequences. First, the Great Convergence "has not arrived from a sudden or artificial blend of the 'soft' or 'moist' *bios* and the 'hard' or 'cold' *techne*; instead, *techne* is an inherent feature of *bios*. To various extents, biology is digital information and digital information is biology; one cannot be divorced from the other." Second, "[t]he ability to turn biology into digital code, and then to return digital code back into biology" enables "tinkering with and actively transforming living organisms" (Peters, Jandrić, and Hayes, 2021; see also Peters, Jandrić, and Hayes, 2022). Finally, these developments open up many social and ethical issues. For instance, bioinformational achievements such as vaccines are mutually constitutive with sociology and psychology of vaccinations (McKenzie et al., 2021); governments and international institutions keep a strong legislative grasp on the development of gene editing technologies to avoid negative consequences (Peters, Jandrić, and Hayes, 2022).

Biology, information, and society have always been interconnected. A simple, pre-digital example is a human being (biology) reading a book about democracy (information) and applying it at a ballot (society). Yet the Covid-19 pandemic, and its numerous challenges, from tracing infecting persons through Covid-passports to anti-vaccination movements, have complicated and intensified these relationships in our widely digitised society. For each of us as individuals, these are changes that affect our positionality in postdigital society (Hayes, 2021). Some people have greater digital access than others to take advantage of related health or education benefits that emerge, whilst others may be positioned at a disadvantage when data is gathered on them. How individuals are placed in healthcare systems is rapidly changing, due to disruptive technologies, Internet of Things (IoT), artificial intelligence and biodigital convergence.

Narang (2021, p. 85) discusses examples of IoT in healthcare, such as 'hearables', which are new hearing aids that transform how those with hearing loss interact with the world, as they are compatible with Bluetooth and therefore can sync with a smartphone. This allows a wearer to filter, equalize, and add layered features to real-world sounds. Such valuable benefits are not though necessarily available to those who are without the income to run a smart phone, pay for related data, or the ability or opportunity to learn the skills required, to interact with hearables. Then there are 'ingestible sensors' which are pill-sized and, when swallowed, monitor the medication in our body and warn us if they detect any irregularities. For a diabetic patient this can curb symptoms and provide an early warning. Or in the case of 'moodables', which are head-mounted wearables that send low-intensity current to the brain which elevates our mood (Narang, 2021: 85) there are clearly exciting possibilities, as well as challenges. Issues of data security and privacy for individuals need to be balanced against the benefits of many organisations accessing healthcare analytics and tracking reports on patients. Although connectivity protocols are enabling new ways to spot and treat illnesses, integration of multiple devices across protocols requires a consensus across stakeholders. The human dimensions converge further with informational and societal concerns, as data-overload can also hamper the decision-making by health professionals (Narang, 2021: 84).

These few examples, among many, demonstrate wide-reaching implications for the field of Networked Learning. Where once the focus on the 'network' may have largely involved the devices, new ubiquitous computing technologies, wireless mobility and computer mediated communications, this often concerned the 'learning' of humans as they travelled and used various networks. With greater postdigital-biodigital convergence, there has been a considerable shift that requires a focus too now on how new technologies and their related data travel through people, and indeed how they in turn use humans.

In the third decade of the twenty-first century, various aspects of human lives, including teaching and learning, are situated at the intersections between biology, information, and society (Jandrić, 2021). Current research in the field is scattered across publications and its language is fairly inconsistent. Based on our previous research in the field, we now provisionally define the main terms used in the rest of the article.

Bioinformation refers to a scientific convergence between "biology as digital information, and digital information as biology, are dialectically interconnected" (Peters, Jandrić, and Hayes, 2021a).

Biodigitalism is a wider perspective, that is "[t]heoretical and practical (praxis); scientific and technical (technoscience); analogue and digital (postdigital); biological and informational (bioinformational); and political and economic (bioinformational capitalism)" (Peters, Jandrić, and Hayes, 2021a).

Postdigital "is a wide-open position or perhaps even a worldview which encompasses various reconfigurations between technologies and humans. This applies to all kinds of technologies, including but not limited to biodigital technologies. … [t]he biodigital is an important aspect of the postdigital idea, but it is far from the only one." (Peters, Jandrić, and Hayes, 2021b)

"Viral modernity is a concept based upon the nature of viruses, the ancient and critical role they play in evolution and culture, and the basic application to understanding the role of information and forms of bioinformation in the social world. The concept draws a close association between viral biology on the one hand, and information science on the other – it is an illustration and prime example of bioinformationalism that brings together two of the most powerful forces that now drive cultural evolution." (Peters, Jandrić, and McLaren, 2020)

Taken directly from our recent works, these definitions are only indicative; rather than providing in-depth analyses, they merely serve to establish what we mean by defined concepts and build background for our research in this paper.

Postdigital-biodigital challenges in networked learning

Since its inception, the Networked Learning community has importantly cherished the values of openness and free access. The conference proceedings of all Networked Learning conferences and books in the Research in Networked Learning book series are available online, so this large body of research is easy to access and explore. Our first attempt at looking at postdigital-biodigital challenges therefore consisted of a simple search

using relevant keywords such as bioinformation, biodigital(ism), biology, postdigital, and so on. This search has yielded very limited results, implying that a lot of postdigital-biodigital work in networked learning is implicit, rather than explicit. Since our 'brute-force' attempt at identifying postdigital-biodigital approaches in Networked Learning failed, we returned to definitions and theories.

Postdigital-biodigital can be found already in the first definition of networked learning:

> We define 'networked learning' as learning in which [information and communications technologies are] used to promote *connections*: between one learner and other learners, between learners and tutors; between a learning community and its learning resources. Some of the richest examples of networked learning involve interaction with on-line materials *and* with other people. (Goodyear et al., 2004, pp. 1-2)

Speaking of connections between a community and its resources, of interactions between digital materials and people, this definition exhibits a clear focus to postdigitalism-biodigitalism. Two decades later, Dohn et al. (2018) and De Laat and Dohn (2019) identified four understandings of Networked Learning, one of which is "an emphasis on connections between (human and non-human) actants – understanding learning situations as entanglements of people and things" (Networked Learning Editorial Collective, 2021, p. 316). Similar ideas can be found across a range of definitions and theories of Networked Learning, yet implicit reference to postdigitalism-biodigitalism reaches way beyond definitions. In what follows, we expand our search for postdigitalism-biodigitalism in Networked Learning research more generally.

A lot of Networked Learning research, especially that arriving from Edinburgh University's research group led by Siân Bayne, takes a critical posthumanist approach (see Jandrić, 2017, Chap. 9).

> Posthumanist philosophy constitutes the human as: (a) physically, chemically, and biologically enmeshed and dependent on the environment; (b) moved to action through interactions that generate affects, habits, and reason; and (c) possessing no attribute that is uniquely human but is instead made up of a larger evolving ecosystem. There is little consensus in posthumanist scholarship about the degree to which a conscious human subject can actively create change, but the human does participate in change. (Keeling and Nguyen Lehman, 2018)

Indeed, (human and non-human) agency is a prominent question that situates Networked Learning research in the broad area of sociomaterialism. However, Networked Learning is not a passive recipient of these theories; over the years, Networked Learning research has significantly contributed to theory and practice of sociomaterialism and critical posthumanism beyond its immediate focus to learning.

One such example arrives from the works of Chris Jones, who argues that Networked Learning

> outlook remains broadly sociomaterialist in that it continues to conceptualise knowledge and capacities as being emergent from the webs of interconnections between heterogeneous entities, both human and non-human. However, it differs from the strong readings found in ANT and post-humanism in that the author argues that all actors cannot be treated as completely symmetrical for research purposes because of the particular access that we have to accounts of experience from human actors. (Jones, 2018, p. 51)

Indeed, Actor Network Theory (ANT) is often used in networked learning research; in turn, insights developed in the context of Networked Learning have significantly influenced ANT in works published beyond the Networked Learning community (e.g., Royle, 2021).

Another significant area of Networked Learning research inseparable from the postdigital-biodigital challenge are learning spaces[1]. The acknowledgement of 'in between' spaces and their importance in changing patterns of

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[1] Latest research in the field can be found in *Postdigital Science and Education, 4*(1), which is a Special Issue on 'The Postdigital Learning Spaces of Higher Education', edited by prominent members of the Networked

Proceedings for the Thirteenth International Conference on Networked Learning 2022, Edited by: Jaldemark, J., Håkansson Lindqvist, M., Mozelius, P., Öberg, L.M., De Laat, M., Dohn, N.B., Ryberg, T.

learning both online and offline, but also in classrooms, buildings, campuses and the city are viewed by some in terms of a 'networked learning landscape' (Nordquist and Laing, 2015). Multiple interconnected aspects of life align with changing curricula. We would add to this some considerations of converging disciplines across curricula too, as these alter in postdigital-biodigital society. It becomes important, as we discuss changing learning spaces, to also consider the role of places, and indeed time. Networked Learning takes a holistic approach in seeking to understand what occurs for individuals who are learning across complex and dynamic contexts. Time in these spaces can no longer be considered in only linear, commodified patterns, which in turn requires new forms of writing educational policies that do not separate technology from human labour, in all of its intimate spaces and forms (Hayes, 2015).

Language and terminology, underpinned by global, neoliberalist values, has also been an ongoing concern for Networked Learning scholars. What is assumed and written in policies for technology, as applied in educational contexts, has human and material consequences that are realised in workloads and health issues if the time and labour involved is not acknowledged. Uncovering such forms of deception through linguistic analysis is one way to explicitly "restore our human visibility" (Hayes, 2016). This becomes important amid the realisation that many of our global concerns about sustainable means of production in industry are echoed in practices within increasingly marketized education. Yet change could be on the horizon as the neoliberal economic model becomes challenged by 'advanced biodigital developments and principles of bioeconomy'. These require education based on environmental self-renewal, rather than consumer consumption' (Peters, Jandrić, and Hayes, 2021b). Additionally, any shift in economic ethos and practices requires too sustainable education and indeed policy that discusses the diverse positionality of humans honestly in postdigital-biodigital society (Hayes, 2021).

Why focus to postdigital-biodigital challenges in networked learning? And why now?

Networked Learning is a philosophy, a research approach, a rich set of diverse practices, an "educational paradigm" (Jones, 2015), and much more. However incomplete, our overview of Networked Learning research suggests a long history of deep and successful engagement with postdigital-biodigital challenges in theory (critical posthumanism, sociomaterialism, learning spaces, linguistics, etc.), practice (ANT etc.), and definitions old (e.g., Goodyear et al., 2004) and new (Networked Learning Editorial Collective, 2021; Networked Learning Editorial Collective et al., 2021). Explicit references to the postdigital-biodigital challenges in theory and practice of Networked Learning are scarce, yet implicit references are almost omnipresent. We would go as far as to say that postdigital-biodigital challenges lie at the very heart of Networked Learning, and that the Networked Learning community has made a considerable global contribution to researching these challenges. So why 'discover the wheel' and focus to things that are already here? And why do that now?

Scholarly research is always closely related to its *Zeitgeist* – and these days, our *Zeitgeist* changes in a blink of an eye. Looking for example(s), the archive of books of proceedings following 13 Networked Learning Conferences[2] does not merely present the development of Networked Learning research; it also displays different interests, and different foci, of the community in different historical periods. In 1998 the community was focused to lifelong learning; in 2002 there was a lot of talk about communities of practice; 2010 surfaced a plethora of issues related to globalisation, interculturality, and international development; 2016 was felt as the right time for reflection and 'looking back – moving forward'. Since 2020, obviously, the (narrowly defined) topic of the day are various questions arising from the Covid-19 pandemic, and looking more generally, the postdigital-biodigital challenge. As the community, and indeed the whole world, struggles to make sense of our pandemic moment, it is important to emphasize that this research does not start from scratch and there is a lot of excellent earl(ier) Networked Learning research that can help and support our efforts.

Convergence

Learning community, James Lamb, Lucila Carvalho, Michael Gallagher, and Jeremy Knox. https://link.springer.com/journal/42438/volumes-and-issues/4-1. Accessed 28 January 2022.
[2] See https://www.networkedlearning.aau.dk/past-conference-proceedings/. Accessed 24 January 2022.

Proceedings for the Thirteenth International Conference on Networked Learning 2022, Edited by: Jaldemark, J., Håkansson Lindqvist, M., Mozelius, P., Öberg, L.M., De Laat, M., Dohn, N.B., Ryberg, T.

One such early example is the notion that Networked Learning itself "can be considered the outcome of convergence" (Jones and Steeples, 2002, p. 3). Perhaps this was somewhat prophetic in nature when, 20 years later, we can notice and discuss "the technoscientific convergence that is taking place with biodigital technologies in the postdigital condition" (Peters, Jandrić, and Hayes, 2021b, p. 1). Today's research arrives under various names and labels such as bioinformationalism, biodigitalism, postdigitalism, viral modernity, and others. These new (and newly popularized) terms are not mere linguistic exercises, as they point towards previously unseen or much less relevant phenomena. Let us quickly examine what is brought by concepts defined at the beginning of the chapter to notice longstanding connections with earlier discussions of convergences of telecommunications, digital computer and information technologies, distance and place-based learning and resulting hybrid forms (Mason and Kaye, 1990).

The concept of bioinformation has a long historical tail: more recently, it has already been researched well beyond Foucault in fields such as mobility studies (Traxler et al. 2021). Yet the introduction of Covid-passports with citizens' biodata has opened up a plethora of questions at the intersections between bioinformation, privacy, freedom, and human rights (Zuboff, 2019). While we could research these developments without using the word bioinformation, the concept does focus our attention to these new developments and concerns.

Biodigitalism expands this focus in various directions, most notably to recent transformations sometimes called bioinformational capitalism (Peters, 2012). Indeed, social science research into Covid-passports must acknowledge the fact that copyrights and production lines for most currently available vaccines belong to the corporate sector. While this does not imply, by any means, validity in this or that Big Pharma conspiration theory, critical research must, among other leads, also follow the money and criticize the social system (Peters, 2020).

Postdigitalism speaks of general relationships between humans and technologies and is well-suited for the bioinformational / biodigital mesh-up between the digital and the analog. Asking important questions such as those pertaining to human nature (Savin-Baden, 2021), postdigitalism links questions of our day to eternal (human) concerns.

The concept of viral modernity is of a different order of magnitude. Viral modernity can hardly say anything about ontology or epistemology, as it predominantly focuses to concordances between the 'behavior' of information and viruses. Yet the question of post-truth and fake news, which is bioinformational, biodigital, and also postdigital, is a burning issue of today – and the concept of viral modernity, amongst others, can help us shed a fresh light on it (Peters, Jandrić, and McLaren, 2020; Peters and Besley, 2021).

Conclusion

This paper shows that Networked Learning has always had a strong yet implicit focus to postdigital-biodigital challenges. With the advent of the Covid-19 pandemic, however, these challenges have been brought to the fore and have developed in various practical directions such as Covid-passports. Networked Learning has a lot to offer to current research in the field; listing its main contributions, and linking them explicitly with challenges of our day, that may be of practical help to researchers. The role of convergence is an important and sustained concept that can help in breaking down perceived barriers to developing cross-cutting research in any of the areas discussed in this paper: "The use of networked information technologies has blurred the boundaries between the methods used in both forms of education and the clienteles they address" (Jones and Steeples, 2002, p. 3).

Today's popular concepts connected to convergence, such as bioinformation, biodigitalism, postdigitalism, and viral modernity – many of which have arrived well after Networked Learning – are at the same time closely linked to, and distinct from, Networked Learning. As de Laat and Dohn wrote (2019: 19) in a recent article, "the question *Is networked learning postdigital education?* is far from rhetorical, and the answer certainly is not no. Neither is it, however, a clear yes" (emphasis from the original). Definitional questions remain well beyond the scope of this article, yet our research indicates that these concepts do help us focus our research efforts and should be embraced in the theory and practice of Networked Learning research.

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