

# Sociotechnical imaginaries in the present and future university

Matthews, Adam

DOI:

[10.1080/17439884.2021.1864398](https://doi.org/10.1080/17439884.2021.1864398)

License:

Creative Commons: Attribution-NonCommercial-NoDerivs (CC BY-NC-ND)

*Document Version*

Peer reviewed version

*Citation for published version (Harvard):*

Matthews, A 2021, 'Sociotechnical imaginaries in the present and future university: a corpus-assisted discourse analysis of UK higher education texts', *Learning, Media and Technology*, vol. 46, no. 2, pp. 204-217.  
<https://doi.org/10.1080/17439884.2021.1864398>

[Link to publication on Research at Birmingham portal](#)

## **Publisher Rights Statement:**

This is an Accepted Manuscript version of the following article, accepted for publication in *Learning, Media and Technology*. Adam Matthews (2021) Sociotechnical imaginaries in the present and future university: a corpus-assisted discourse analysis of UK higher education texts, *Learning, Media and Technology*, 46:2, 204-217, DOI: 10.1080/17439884.2021.1864398. It is deposited under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

## **General rights**

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

## **Take down policy**

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact [UBIRA@lists.bham.ac.uk](mailto:UBIRA@lists.bham.ac.uk) providing details and we will remove access to the work immediately and investigate.

**Sociotechnical imaginaries in the present and future university: A corpus-assisted discourse analysis of UK higher education texts**

Adam Matthews

*School of Education, University of Birmingham, Birmingham, UK;*

[a.matthews.3@bham.ac.uk](mailto:a.matthews.3@bham.ac.uk)

# **Sociotechnical imaginaries in the present and future university: A corpus-assisted discourse analysis of UK higher education texts**

## **Abstract**

Technology has dominated discourse on the future university and how digital technologies disrupting wider societal activities can be leveraged in higher education. To gain an insight into UK institutional perspective on technology adoption in teaching and learning and visions for the future, two corpora of text are analysed: Teaching Excellence Framework statements (n=88) and university strategy documents (n=88), totalling 1, 129, 736 words. Quantitative empirical analysis reveals that institutions write about technology in education activities and how they 'use' technology. Interpretative analysis found that technology is 'used' as an end in itself as well as a means for specific ends (such as assessment and feedback and flexible learning). Using concepts from science and technology studies and philosophy of technology, these perspectives are theorised as instrumental and essentialist and problematised when viewing technology in education as apolitical, neutral and inevitable. A perceived neutrality ignores the many competing ideologies and interests at play. In this context, a dichotomy of 'pedagogy first' or 'technology-led' design is explored. Critical theory of technology is used to bridge these binary discourses which are described as reductive in a complex sociotechnical university assemblage.

## Introduction

There has been a growing number of critical scholars questioning the deeply embedded term technology-enhanced learning (TEL) in Higher Education (HE). One of the main questions has centred around the unchallenged and inherent assumption that technology automatically *enhances* learning. Bayne (2015), questions the simple acceptance of technology ‘enhancing’ learning which then, restricts rather than opens up new and diverse possibilities for digital technologies. Goodchild and Speed (2019) problematise this enhancement as not a fixed set of practices but discursive and an accepted orthodoxy as ‘social, political and fantasmatic logics combine to create the hegemonic dominance that TEL enjoys in the field’ (p959). In policy terms ‘TEL’ has become nominalised, again seen as uncritical good whereby any human agency is removed and it is the technology which enhances learning and not teachers and students (Hayes 2019). Gourlay (2012) sets out the challenge of the increased ubiquity of digital technologies in the contemporary university in trying to maintain traditional practices in digital form or to adopt a techno-rationalist model of ‘elearning’ which has the potential to reduce higher education to knowledge transmission. Gourlay goes on to use a posthuman perspective to bridge such binary divides which she describes as allowing for universities to truly innovate in the posthuman university.

Critical engagement with these issues is important as there is hope that new technologies do have huge potential to be part of meaningful approaches to help tackle some of the most pressing issues in education, such as, massification, government regulation, funding issues, access and participation, inequalities and teaching quality (Selwyn et al 2020a). Critical theory and new perspectives are required to meet the call for the future of EdTech to be both critical and to find alternatives:

“Amidst all these ‘big’ challenges is the need to remain hopeful and continue to ‘think otherwise’. In an era when many commentators presume ‘there are no alternatives’, one of the key roles of critical scholarship is to find alternatives.”  
(Selwyn et al 2000a p4)

Communication technologies have long promised to ‘disrupt’ education as well as widen access. The mid 20th century saw adoption of radio and television, followed by personal computers in the 1990s and then widespread access to the internet at the turn of the century (Spector 2002).

This article looks at texts produced by UK universities to analyse how institutions discursively construct technology adoption in teaching and learning. In pursuing a critical approach to the discourse of university adoption and visions of new technologies, concepts from Philosophy of Technology (PoT) and Science and Technology Studies (STS) are used to theoretically position the findings of the corpus-assisted discourse analysis of institutional texts and the ‘use’ of technology. Hamilton and Friesen (2013) report a lack of engagement from researchers in education with PoT and STS, summarising that:

“A neat fit thus appears to exist whereby, for essentialists, human capacities are enhanced by technology, or by which, for instrumentalists, technical things transparently correspond to the intentions of users. As we will see, both positions have significant flaws that must be addressed if we are to understand online education as a field of development, research and practice.” (p4)

High on the wishlist of *Learning, Media and Technology* in 2019 was new ways of representing networks of humans and things in the context of posthumanism and learning (Williamson et al 2019). This has been hastened by the 2020 Covid-19 pandemic and the need for critical perspectives and reflections on the sociotechnical in

education as the planet pivots to online, adopting ‘pandemic pedagogies’ (Williamson et al 2020). The posthuman along with the established fields of PoT and STS are useful and fruitful areas of study and integration for those studying education as the social and the technical become ever more intertwined.

I begin with an overview of some of the sociotechnical imaginary discourse which has described some of the potential for education and new technologies. These positions will form a thread to the article with insight from PoT and STS to analyse the results of a corpus-assisted discourse analysis of texts in which institutional discourse is dominated by ‘uses’ of technology. Methods and data are then presented before a corpus-assisted discourse analysis of publicly available UK university regulatory and strategy documents. The analysis of UK university texts as instrumental and essentialist are then viewed through the argument of ‘pedagogy first’ or ‘technology led’ educational design. The article concludes with a counter discourses to the instrumental and essentialist ‘use’ of technology in education using critical theory.

### **The discourse of sociotechnical imaginaries for the future of education**

Sociotechnical imaginaries occupy a hinterland between politics, culture and sociotechnical systems (Jasanoff and Kim 2015).

“Multiple imaginaries can coexist within a society in tension or in a productive dialectical relationship. It often falls to legislatures, courts, the media, or other institutions of power to elevate some imagined futures above others, according to them a dominant position for policy purposes. Imaginaries, moreover, encode

not only visions of what is attainable through science and technology but also of how life ought, or ought not, to be lived; in this respect they express a society's shared understandings of good and evil" (p4)

Analysis of discourses associated with technology and education then are an important object of analysis in uncovering the accepted as well as contested discourses and the ideologies which produce sociotechnical imaginaries of the university. In analysing institutional discourse, the university is just one of the institutions with the power to elevate some imagined futures above others.

There are a range of sociotechnical imaginaries currently playing out in higher education and wider society. This discourse is dominated by a culture of disruption and solutions to 'fix' a broken education system. Predictions of the future with increased automation and rapid pace of technological change have placed thinking about desired or inevitable futures as a field of study as well as big business (Amsler and Facer 2017; Facer 2011).

Means (2018) analysed the discourse and sociotechnical imaginary of two US organisations (The Institute for the Future and Knowledge Works) who strategically forecast the future of learning and work. The discourse of both organisations included a global integration of work, learning and life (learning, earning and living); personalised to each individual with user-profiling data; connecting 'edu-preneurs' to employers in a gig economy via a 'talent cloud'; learning as currency in a learning economy; learning will be abundant rather than scarce as it is within schools and universities and learning will be unbundled from these institutions in a platform-based ecosystem powered by machine learning; mobile apps and continuous data and feedback loops. Both examples for Means are underpinned by a discourse of liberatory shattering of traditional publicly

regulated education institutions through computational logics, efficiency and digital optimization, all underpinned by neoliberal economics and individualism. Importantly these discourses for Means are presented as apolitical, neutral and a natural and inevitable development. Discourse then which presents technology as apolitical, neutral and inevitable is an important area of analysis in higher education and, in the context of this study to shine a light on institutional perspectives on such adoption and visions of new technology in the university.

Sociotechnical imaginaries within education have been influenced by the prevalence in many aspects of society on the digital platform. Digital platforms for sharing have emerged in the past 10 years and have been broadly termed the ‘sharing economy’ disrupting industries such as hospitality and travel with the platforms Airbnb and Uber (Sutherland and Jarrahi 2018). These centralised platforms use digital technologies to connect producers with consumers at large scale. Major technology companies are economic actors within these platforms, mining big data from their users for advertising (Google and Facebook etc), providing products (Spotify etc) and lean (Uber, Airbnb) platforms with a business model of free and paid for services (through data and money) (Srnicsek and De Sutter 2016). This technological market of platform capitalism driven ideology is present and expanding into higher education both externally through student services and apps, such as LinkedIn for employment (Komljenovic 2019) as well as internally through plagiarism and EdTech products procured by universities themselves (Hall 2016; Williamson 2019). The introduction of third parties to provide products and services to universities has been termed ‘unbundling’ (McCowan 2017). The unbundling of functions of the university have been viewed as both a wholesale positives to help reduce costs and take advantage of specialist expertise and technology which can help to increase access to universities as



more people pursue a university education. The negative aspect of unbundling includes loss of expertise, deprofessionalisation of faculty and the removal of a holistic approach to a university experience and mission (Gehrke and Kezar 2015). A case study of a major multinational providing digital platform products as services by Williamson (2020) concluded that marketization is accomplished through a complex sociotechnical assemblage ‘including platforms, as well as the numbers and charts, human and nonhuman agents, machine learning algorithms, visualizations and infographics, market valuations, reports and discourses that all support the construction, maintenance and diffusion of those platforms’ (p 14). Williamson raises issues over governance; stripped back reductive data analysis of human learning which are reshaping understandings of learning processes and thus approaches to education resulting in ‘robot pedagogies’; pedagogic relationships then become market exchanges and transactions aligned with employability as a key metric for labour markets, producing dependencies on the ‘edu-business’ technology companies. Outside of the campus boundaries, the social media platform for professionals and the labour market, LinkedIn, is able to take the employability agenda and match individuals to employers as well as learning resources for students. Universities themselves are encouraged to use the platform as a resource for students and their future careers and thus track alumni and their career trajectories (Komljenovic 2019). Moreover, students and universities are becoming ‘prosumers’ in that they are using products and services as consumers but also producing the currency of such sociotechnical assemblages – data. The centralized approach of digital platforms then, have the potential to change education values and systems (Hillman et al 2020). Returning to the focus of this article we can begin to see issues when looking to instrumental and essentialist ‘use’ of technology in that many of these technologies have many actors involved with competing priorities in the design, development,

marketing and implementation of technologies from a political, social and technical perspective. At the level of software itself, Duvall (2016) analyses the discourse of software which enacts certain ways of teaching with the choices of words which are used to describe ‘functions’ of the software. More broadly Knox et al (2019) report how the influences of data science and machine learning can indeed determine the very essence of education, resulting in ‘machine behaviourism’ whereby education comes to resemble quantifiable sciences such as data science, machine learning and behavioural psychology with learning analytics and nudging for efficiency precision.

With these ideas and perspectives from some of the current sociotechnical imaginaries for technology and education and critical responses, I move forward with an empirical analysis of discourse written by UK universities on technology in teaching and strategy for the future.

## **Methods and data**

The study of discourse in education has grown from the peripheries of the broader social sciences to a mainstream field of research influenced by poststructuralism in philosophy, a ‘linguistic turn’ in the social sciences and a ‘social turn’ in linguistics (Edwards et al 2004). Edwards links rhetoric to discourse, but takes rhetoric further as a persuasive act or what some may more cynically describe as ‘spin doctoring’.

“Language, enacted as discourse, is an instantiation of what people believe, for example, their personal values related to technology and learning. Yet widely held conceptions persistently sever technology from people and the social, political and cultural relationships that brought it into existence in the first place.

A ‘developer's itch’ may bring a technology into being, but the human hand of development, the voice of aspiration and indeed acts of mis-appropriation do not leave the scene just because we claim in discourse that ‘the use of technology’ achieves only positive improvements.” (Hayes & Jandrić 2014 p198)

The data used in this study (TEF2 statements and strategy documents) are designed to be persuasive in that they are persuading a regulatory panel of the worthiness of teaching excellence and more widely, the ambitious plans for the institution over the coming years. Some scholars hold that every text has an element of persuasiveness, including scientific discourse (Fahnestock 1986). Here we can start to see some of the potential ‘traps’ when attempting to understand and analyse discourse which studies science and technology – the mechanical and the scientific can commonly be seen as neutral and objective.

Rhetoric itself in the common use of the word is contrasted with action and associated with lies and half-truths and often described as ‘mere rhetoric’ to somewhat dismiss it as pointless or ignored (Leach 2000). Despite this common view, the discourse of persuasion, half-truths and lies play an important role in forming knowledge. “Once discourse enters a communication arena, it is no longer under full control of those who produced it. This is central to remember in analysis” (Leach 2000: 224). Selwyn (2014) goes as far as to call rhetoric claiming technological fixes for education as bullshit which can become invisible as we see and hear so much of ‘Ed-Tech Speak’.

“The restricted forms of language that prevail in any area of society play a key part in maintaining the parameters of what is, and what is not, seen as preferable and possible. Language therefore needs to be recognized as a key element in

informing ideas and shaping actions within any educational context.” (Selwyn 2014 (2))

Selwyn uses Harry Frankfurt’s theoretical understanding of bullshit in that these claims are not outright lies or bluff, but the discourse could be true, but is produced without concern for the truth, thus leading us away from reality. Lies and truths are symmetrical but bullshit is somewhere in between and not necessarily under full consciousness of the speaker or writer (Frankfurt, 2005).

“Language is clearly a key element to improve the conditions of education and technology. So let us be more mindful of the words that are used, and the ways in which they are used. Let us set about talking more frequently and forcibly about education and technology in ways that foreground issues such as democracy, public values, the common good, morals and ethics. Let us challenge the tired buzz-words and taglines that distort discussions of education and technology. Let us be more confident in calling out lazy generalizations and out-right bullshit.” (Selwyn 2014 (6))

Corpus linguistics has a long tradition of complete and systematic investigation of large, authentic and representative texts which are computer readable using corpus analysis software (Stefanowitsch 2020). Quantitative computer analysis most commonly feature word frequencies, collocations and concordance lines (McEnery and Wilson 1996). Word frequencies tell us the prominence and dispersion of a word, collocations statistically identify adjacent words and concordances allow us to view the keyword in context in series of (concordance) lines (Baker 2006). This analysis uses an initial

quantitative corpus analysis followed by a more traditional qualitative analysis. Baker (2006) describes this as ‘mapping’ the corpora which can then guide the next stage of the analysis informed by quantitative results (examples include Mautner 2005; Baker et al 2008; Matthews and Kotzee 2019; Matthews and Kotzee 2020). This study will map the assembled corpora by focusing on ‘technology’ as a point of entry into the corpora and then follow up with interpretative analysis of the identified keywords in context. Baker (2010) describes this as combining socio and corpus linguistics for frequency indicating: markedness, collocations to unpack ideological assumptions and concordances for semantic preference and discourse prosody.

The data is made up of naturally occurring text produced by UK universities. 88 university TEF2 statements from summer 2017 and their university strategy documents were analysed. The sample of 88 was dictated by the availability of both documents. For example, not all universities submitted to the TEF2 exercise in 2017 and not all HEIs have online strategy documents available in PDF format. Table 1 provides an overview of the assembled corpora. The 88 HEIs from both corpora are the same institutions.

| Table 1: An overview of corpora used for analysis |           |         |
|---|-----------|---------|
| Corpus  | Documents | Words   |
| Teaching Excellence                               | 88        | 767,168 |
| University Strategy                               | 88        | 362,568 |

The Teaching Excellence Framework in the UK has been introduced as a regulatory tool to raise standards in teaching and attempt to bring parity between

research and teaching (Gunn 2018). The framework, devised in 2016 has three aspects: Teaching Quality (TQ), Learning Environment (LE) and Student Outcomes and Learning Gain (SO) (HEFCE 2016). Each participating institution were awarded gold, silver or bronze award based on quantitative measures as an initial hypothesis, followed by the reading of a 15 page, written, qualitative submission. As part of the guidance under the aspect of TQ, universities are encouraged to provide examples of evidence on (amongst 10 other possible examples) 'Impact and effectiveness of innovative approaches, new technology or educational research' (HEFCE 2016, 44). Each participating institution's qualitative submission have provided an openly available set of documents for analysis (Office for Students 2018).

TEF2 statements provide a narrative of teaching activity under the context of prescribed government policy. Strategy documents in contrast, look to the future, they set out the aim of the university and how they will achieve these aims. The discursive construction of the university and its future in such documents have been used as insightful data for the discursive construction of the future of the university (Özdem 2011; Mayr 2008).

Clearly, both genres of texts have a communicative purpose in that work has taken place by a variety of actors to agree upon the texts form, structure and content. As Bhatia (1993) points out, the text is not a complete object with its own meaning but an ongoing process of negotiation in the context of issues like social roles, group purposes, professional and organizational preferences and prerequisites, and even cultural constraints' (19). Communicative purpose of a genre then becomes a complex relationship between writer(s), the text and readers (Askehave and Swales 2001). The producers and users of texts are epistemic communities who 'manage' the discourse in

certain ways. By analysing both genres of texts described here an intertextuality is presented which offers a deeper insight into institutional discourse from two different perspectives and contexts to investigate underlying ideologies and perspectives (Mayr 2008).

### **Corpus-assisted discourse analysis**

Firstly, an introductory analysis was conducted on the key word ‘technology\*’. Table 2 shows the frequency of the keyword in both corpora including relative frequency for comparison and dispersion across all documents. This initial analysis is not particularly enlightening but gives us a starting point to map the corpora with the keyword ‘technology\*’. LancsBox 4.0 software was used to conduct the analysis (Brezina et al 2018).

| Table 2: An overview of keyword analysis – ‘technology*’ |           |                   |            |
|--|-----------|-------------------|------------|
| Corpus   | Frequency | Frequency per 10k | Dispersion |
| TEF2   | 338       | 4.41              | 81/88      |
| Strategy   | 284       | 7.83              | 70/88      |

To further the analysis of this keyword, the collocations of ‘technology\*’ were extracted to begin to give a deeper understanding of the keyword in context.. As Firth (1957, 11) famously quoted: “you shall know a lot about a word from the company it keeps”.

Tables 3 contains the strongest and most frequent collocations for the keyword (technology\*).

| Table 3: Collocations of keyword “Technology*” spanning 5 words either side (5x5).<br>Collocations are listed with the highest frequency, frequencies are reported with a minimum frequency of 10 and minimum MI statistic of 5.0. |   |
|--|---|
| Corpus   | Collocate (frequency)   |
| TEF2   | Learning (136), use(52), enhanced (47), science, (20), new (20) digital (19), engineering (15), enhance (12), assistive (11), tel (11), innovative (11), school (11), media (10), spaces (10) |
| Strategy   | Learning (51), science (36), use (36), digital (27), engineering (25), information (19), mathematics (13) & (12), appropriate (11), using (10), resources (10) facilities (10)                |

The most frequent and strongest collocate in both corpora is ‘learning’. In TEF2, third most frequent is ‘enhanced’ which as described above, technology enhancing learning unquestionably and uncritically, has been challenged (eighth is ‘enhance’). Also, in the list is ‘tel’ which is the acronym for ‘technology-enhanced learning’. ‘Assistive’ technologies are deployed for those with special education needs (Erdem 2017).

Dominating both corpora in the context of technology is ‘use’ and ‘using’. The second most frequent of the strongest collocates is ‘use’ in TEF2 (third in strategy is ‘use’ and ninth ‘using’). The initial corpus analysis has uncovered the prevalent terms



such as ‘technology enhanced learning’ but also that universities ‘use’ technology both in describing teaching excellence and also in the future vision of the university.

In order to go beyond a quantitative analysis of technology discourse in relation to teaching and learning, text passages (concordance lines) were extracted from the corpus manually in which ‘technology\*’ was used in relation to the broad focus of technology in education. Text extracts which described technology in the context of courses or departments involving technology were not included for this follow up. From these extracts only those which contained ‘use’ or ‘using’ were taken forward for interpretative thematic analysis (Braun and Clare 2006) to understand how universities write about their use of technology in both corpora. Nvivo software was used to inductively code these text extracts. Constant comparison was used (Bryman 2008) within and between text genres for comparison to construct a substantive theory of the ‘use’ of technology in the context of the contemporary university.

| Table 4: Thematic analysis of TEF2 corpus text extracts |           |   |           |
|---|-----------|---|-----------|
| Theme   | Frequency | Sub theme                                     | Frequency |
| Use of technology – means and ends                      | 57        | Feedback and Assessment                       | 22        |
|   |           | Flexible and interactive learning             | 12        |
|   |           | Lecture video and audio capture               | 10        |
|   |           | Access to hardware (ipads and laptop)         | 7         |
|   |           | Workplace and professional skills             | 4         |
|   |           | Analytics and metrics                         | 3         |
|   |           | Improved student attainment and learning gain | 3         |
|   |           | Connect with students on placements           | 2         |
|   |           | Physical spaces and technology                | 2         |
|   |           | Polling and response systems                  | 2         |
|   |           | Assistive technology                          | 1         |

|   |    |  |  |
|---|----|--|--|
| Staff development, resources, monitoring and awards | 31 |  |  |
| Use of technology as an end in itself               | 23 |  |  |
| Student development                                 | 6  |  |  |

Table 4 shows the results of the thematic analysis of ‘use’ of technology in the follow up, qualitative analysis of the TEF2 corpus. Use of technology as a means with defined ends have a sub theme. This is included to present what those ends were. The subtheme of ‘Improved student attainment and learning gain’ is illustrated by the following quote:

“Critically, use of Blackboard is strongly correlated with academic success, demonstrating its effectiveness in supporting student outcomes: students who make most use of the environment double their chances of a good honours grade at module level.”

This quote was not substantiated further, a bold claim and whilst extreme in the corpus shows an example of datafication, machine behaviourism and robot pedagogies of education explored above.

Feedback and assessment themes dominated ends and the discourse was generally using technology to ‘fix’ the issue of timely feedback and assessment. Further themes include staff development which included resources to support development and monitors in place to ensure teaching quality when technology is deployed. Student development is characterised by students’ exposure to technology as a learning outcome in itself. Use of technology as an end in itself was used as a marker of excellence, examples from this discourse include:

“The TEL roadmap aimed to facilitate greater levels of student engagement through the use of technology throughout the whole student journey.”

“The introduction of a comprehensive programme of training is developing a culture that maximises the use of, and commitment to, TEL”

“Our use of digital technology is integrated into all aspects of education.”

| Table 5: Thematic analysis of Strategy corpus text extracts |           |                                  |           |
|---|-----------|----------------------------------|-----------|
| Theme   | Frequency | Sub theme                        | Frequency |
| Use of technology as end in itself                          | 12        |                                  |           |
| Use of technology – means and ends                          | 8         | Expand reach and participation   | 3         |
|   |           | Online distance blended learning | 2         |
|   |           | Learning and skills development  | 1         |
|   |           | Peer teaching                    | 1         |
|   |           | Personalised learning            | 1         |
| Use of technology across all activity                       | 8         |                                  |           |
| Communications  | 3         |                                  |           |
| Student expectations and support                            | 3         |                                  |           |
| Secondary to ‘face to face’                                 | 2         |                                  |           |
| Physical Spaces and technology                              | 2         |                                  |           |

Table 5 shows the results of the same analysis for the Strategy corpus. Again, use of technology including means and ends are articulated as well as broader uses such as use of technology in everything the university does and the implementation of technology into physical spaces. As in the TEF corpus, the theme of technology use is constructed as an end in itself as these examples show:

“Implementing the second phase of the current initiative, [software name], to expand the use of technology-enhanced learning “

“This will allow us to ensure that the use of leading-edge technology- enhanced learning is fully embedded into the academic life of the University.”

This analysis has revealed empirically that UK universities construct technology in the context of education as a tool to be *used* as both an end in itself and as a neutral tool for achieving a specific end. This *use* aligns closely with the essentialist and substantive (and end in itself) as well as instrumental perspectives (neutral tool to achieve a specific end) in the fields of PoT and STS outlined in figure 1 below. These links will be explored further in the context of what is privileged in the educational design process – the pedagogy (as instrumental use) or the technology (as technologically determined, substantive or essentialist).

### **Which comes first, the pedagogy or the technology?**

Kirkwood (2014) calls for a resistance to a technological determinism which results in an essentialist view of technologies having one reified use, and that educational goals and purposes should be prioritised over technology. A pedagogy first approach then, challenges educators and technologists to consider the approach to teaching and learning and then choose or build the appropriate technology (i.e. Sankey 2020).

|                |             |                    |
|----------------|-------------|--------------------|
| Technology is: | Autonomous  | Humanly Controlled |
| Neutral        | Determinism | Instrumentalism    |

|  |   |   |
|--|---|---|
| (complete separation of means and ends)                      | (e.g. modernization theory)                         | (liberal faith in progress)                                   |
| Value-laden<br>(means form a way of life that includes ends) | Substantivism<br>(means and ends linked in systems) | Critical Theory<br>(choice of alternative means-ends systems) |

Figure 1 taken from Feenberg (1999)

PoT and STS have grappled with many of these complex relationships between the social and the technical. For example, Feenberg (1999) compares these positions (see figure 1). Instrumentalist perspectives see technology as a neutral tool to be used by the individual or organisation as they see fit – a goal to be achieved with the tool as a means with which to achieve this. This idea is isomorphic with the discourse of ‘pedagogy first’ – a piece of technology helps to achieve an educational end, regardless of technology. As we have seen in the analysis above, UK university discourse on technology in higher education could be associated with the instrumental as a ‘use’ with a specific end in mind. In direct contrast, technological determinism removes agency from society to place technological development as the driver of social activities. An extreme technological determinism in the context of education is characterised by technological development changing pedagogical practice based on the technology available and its ongoing development (for example, prevalence of social media and other platforms in wider society being adopted in education) . In this study we see that technology use as an end in itself and could be described as deterministic in that the goal is to include technology in the educational assemblage of a university which then has the potential to determine educational practices. Media theorist McLuhan famously stated that the ‘media is the message’ in that the media with which a message is

delivered, changes that message and thus is determined by the media technology (McLuhan 2010). McLuhan might say then in a technologically deterministic manner, that the technology is the pedagogy. Uses of technology as end as found in the above analysis can be described as substantivism or essentialist in that a piece of software or other technology is seen as a fix and value-laden with a specific purpose. For example, in the discourse analysis above, assessment and feedback was the most referenced end to be improved by technology. Many contemporary scholars have dismissed the idea that technology purely determines society but there has been some resurgence in this position in STS as characterised by Wyatt's (2008) chapter titled: *Technological Determinism Is Dead; Long Live Technological Determinism*. Dahlberg (2006) explores instrumentalist, technological determinist and social determinist positions from a media and Internet research perspective and cautions against such reductive moves to overemphasize use, technological form and social context and the risk of determining one position over another (for a detailed description of social constructivism and technological determinism see Matthews (2020)). Hayes & Jandrić (2014) challenge extreme technological determinism discourses in higher education, highlighting complex relationships between technology, the university and people where technology and neoliberal policy agendas can be co-opted to result in single minded techco-scientific development. In direct contrast, while attractive is the idea that humans simply need to harness and take control of technologies (instrumental use) for the good of education, there are a complex set of actors and ideologies at play. Following the positioning of the discourse of UK universities in the context of technology in education I now go on to explore a counter discourse designed to open up possibilities for new technologies in creative and considered ways and to bridge any binary pedagogy-first and technology-led approaches.

## **Alternative and counter-discourse: critical theory of technology**

Dominating the discourse of universities in regulatory written submissions of teaching excellence as well as strategy documents is that technology is a tool to be used for desired ends as well as technology as a given uncritical good.

Feenberg's (2002) critical theory of technology is a response to the divides of instrumentalism, substantivism and determinism and is described as charting "a difficult course between resignation and utopia" and to "... explain how modern technology can be redesigned to be adapted to the needs of a freer society" (p13). Feenberg adopts Lukács reification (1990) and the Frankfurt School of critical theory concept of one-dimensionality. Both reification and one dimensionality in the context of technology place 'things' with a one way of being. Feenberg's critical theory of technology and his project to transform technological thinking, rejects such universalism to include technical rationality along with experience of non-technical actors. Here we can say that both pedagogy and technology are brought together holistically rather than one privileged over the other. Critical theory of technology opens various potentialities for development in both means and ends with a greater participation in design and development from different and diverse perspectives (for example, educators, technologists and students). For example, Selwyn and Gašević (2020) a critical social scientist and data scientist through dialogue and exchange of ideas find common ground and divergence in the potential of technology in education (in this case data science and analytics). Use of technology then becomes a much more complex and philosophical exercise in that there is a technical design and implementation but also a guiding educational principle adopted by an institution or individual all of which are value-laden and not neutral and objective. Feenberg's *Alternative Modernity* (1995) further critiques the two extremes of instrumental use and substantive (essentialist) determinism and

presents a perspective of not moving beyond modernity but to a different, alternative form which acknowledges the rational technical culture approach as well as a democratic societal engagement and public participation with technologies. In education terms, this moves us beyond binary thinking of utopian uncritical enhancement and dystopian datafied control, to imagine and create new possibilities for technology. In the case of the discourse analysed above, a 'solution' to assessment and feedback as a technological 'fix' can go beyond the technical, objective and neutral to include principles and approaches relating to good practice in assessment and feedback which incorporate the affordances of new technologies as reciprocal shaping of assessment practices in a sociotechnical assemblage. New perspectives such as the postdigital (Jandrić et al 2018) and the posthuman (Ulmer 2017) offer ideas and concepts which go beyond the technocratic black box of technology to involve the human (student and teacher) in more democratic ways. The posthuman and postdigital perspectives expand such democracy beyond humans and consider the network of humans and non-humans in complex sociomaterial assemblages. Technologies from these perspectives act and mediate socially situated practices in multimodal digital and analogue contexts (Gough 2004; Gurlay 2015). Feenberg's critique of modernity states that rational technological systems play a privileged role in modern societies, promoting quantitative, rational and neutral ways of thinking. For Feenberg technologies acquire meaning through rhetorical procedures (discourses), interconnections with other technologies that embed a way of life and design features which embed values. I have provided an analysis of two genres of text on the discourse (rhetorical procedures) of technology in higher education which has shown the instrumental and essentialist 'use' of technology and its uncritical 'enhanced' discourse. Technical choices are made at a range stages in technology product development which influence higher education practices. These decisions and



technical choices may exclude and include different voices and experiences (Williamson 2017). When opening such technical black boxes for analysis and going beyond the technical, we may find ourselves questioning the purpose of higher education and other such philosophical questions which not only open up possibilities for technology in education but result in a reflective practice in the ontology of the university. Examples here are the datafication (Williamson et al 2020) of approaches to learning resulting in ‘machine behaviourism’ approaches to learning (Knox, et al 2019) or the purpose of higher education being quantified by outcomes and employment (Matthews and Kotzee 2019).

Gilbert Simondon’s theory of ‘concretization’ (Simondon 1958; Iliadis 2015) describes one design which takes in various perspectives – the technical, the social, the efficient, the economic etc (the technologist, management, the teacher, the student, the environment). Concretization conceptualises elegant design in bringing to bear all needs and requirements and not achieving one perspective and ‘bolting’ on others after the design. Returning to the example of what comes first ‘the pedagogy’ or ‘the technology’, an elegant concretized design brings together pedagogy and technology as well as contemporary issues in higher education which include massification, government regulation, funding issues, access and participation, inequalities, teaching quality etc all identified as current and historical issues in the future of EdTech (Selwyn et al 2020a). Design is becoming a more established field of study in higher education (Goodyear 2015; Fawns 2018; Matthews 2019), interested not just in the technologies but a network approach which looks at the technical artefact, the human and the social as a symbiotic ecosystem (Goodyear et al 2016; Ulmer 2017).

## Conclusion

2020 will be characterised by the year of the Covid-19 pandemic which has left few areas of life unimpacted by the virus including Education and a pivot online has jettisoned many learning technologies. Many of the issues concerning EdTech remain from before the pandemic and have been amplified from disruptive innovations to palliative solutions to ‘save’ and ‘fix’ education (Selwyn et al 2020b). The texts analysed in this study were written before the global pandemic but serve to highlight issues which have become more urgent following the ‘pivot’ online in early 2020. Using a corpus analysis of UK institutional texts, this article reveals a dominant discourse of technology being ‘used’ for specific ends or an end in itself. This may seem innocuous, however, when aligned to conceptualisations of instrumental, substantivist and deterministic theory from STS and PoT we are able to critically analyse the seemingly apolitical and neutral discourse of technology. Critical scholars in the field of EdTech have posed questions and raised issues of the neoliberal, datafied influence of educational technologies in changing pedagogical practices and the very idea of a university with technologists and corporate technology companies offering value-laden ‘fixes’ for education systems. Caution should be taken when a neutral, apolitical discourse is espoused and enacted by institutions when it comes to technology ‘use’ in light of some of the competing perspectives and ideologies that have been explored in this article across a range of actors and technologies. I have problematised the discourse of ‘pedagogy first’ in contrast to a technology-led approach in that both philosophically and in practice they are reciprocally influential. Critical theory of technology has been presented to show the complex assemblages of many actors in education. As highlighted by critical scholars of EdTech, a complex network of actors include commercial and public interest in the unbundled university as well as student and teacher agency mediated by sociomaterial network assemblages of human and non-

human actors (Gourlay and Oliver 2018). Gourlay and Oliver conclude that ‘institutions, just like students, are neither purely users of technology nor entirely powerless before it’ (p157). This article has served to broaden the debate beyond binary divisions of instrumental use (i.e. ‘pedagogy first’) and essentialist, substantivist and technologically determined (i.e. ‘technology-led’) in response to the dominant discourse of using technology for specific ends or as an end in itself. For Hamilton and Feenberg (2012) these reductive binaries are often characterised by factions claiming that to accept technology in the university is to accept neoliberal marketized education and in direct opposition, to reject technology is traditionalist and ‘luddite’. Whilst these polar debates are occurring within the politics of the institution and sector, change is occurring in a more complex manner with new and emerging technologies procured by the university itself and digital platforms used by students and teachers outside of the campus boundary and network.

This work serves to highlight the issues facing higher education and the ever changing technological and economic landscape of EdTech discourse which has been elevated in 2020 with the COVID-19 pandemic. Critical thinking, reflection, debate and collaborative design is called for rather than oversimplifications of instrumental pedagogy over technology (or vice versa) or technology as an end in itself, determining teaching and learning in an essentialist and substantive manner. New potentialities for education are possible and critical theories of technology are offered here to provide new perspectives on the relationship between technology and education.

## **References**

Askehave, Inger, and John M Swales. 2001. ‘Genre Identification and Communicative Purpose: A Problem and a Possible Solution’. *Applied Linguistics*, no. 22: 195–212.

Amsler, Sarah, and Keri Facer. 2017. 'Introduction to "Learning the Future Otherwise: Emerging Approaches to Critical Anticipation in Education"'. *Futures* 94 (November): 1–5. <https://doi.org/10.1016/j.futures.2017.09.004>.

Baker, Paul. 2006. *Using Corpora in Discourse Analysis*. Continuum Discourse Series. London ; New York: Continuum.

Baker, Paul, Costas Gabrielatos, Majid Khosravini, Tony Mcenery, and Ruth Wodak. 2008. 'A Useful Methodological Synergy? Combining Critical Discourse Analysis and Corpus Linguistics to Examine Discourses of Refugees and Asylum Seekers in the UK Press'. *Discourse & Society* 19 (3): 273–306. <https://doi.org/10.1177/0957926508088962>.

Braun, Virginia, and Victoria Clarke. 2006. 'Using Thematic Analysis in Psychology'. *Qualitative Research in Psychology* 3 (2): 77–101. <https://doi.org/10.1191/1478088706qp063oa>.

Brezina, V., Timperley, M., & McEnery, T. (2018). *#LancsBox v. 4.x* [software]. Retrieved from <http://corpora.lancs.ac.uk/lancsbox>

Dahlberg, Lincoln. 2006. 'Internet Research Tracings: Towards Non-Reductionist Methodology'. *Journal of Computer-Mediated Communication* 9 (3): 00–00. <https://doi.org/10.1111/j.1083-6101.2004.tb00289.x>.

Duvall, Matthew. 2016. 'Evaluating Learning Technology Content with Discourse Analysis'. *Educational Media International* 53 (4): 285–97. <https://doi.org/10.1080/09523987.2016.1254884>.

Facer, Keri. 2011. *Learning Futures: Education, Technology, and Social Change*. 1st ed. London ; New York: Routledge.

Fahnestock, Jeanne. 1986. 'Accommodating Science: The Rhetorical Life of Scientific Facts'. *Written Communication* 3 (3): 275–96.

<https://doi.org/10.1177/0741088386003003001>.

Fawns, Tim. 2018. 'Postdigital Education in Design and Practice'. *Postdigital Science and Education*, November. <https://doi.org/10.1007/s42438-018-0021-8>.

Feenberg, Andrew. 1995. *Alternative Modernity: The Technical Turn in Philosophy and Social Theory*. Berkeley: University of California Press.

Feenberg, Andrew. 1999. *Questioning Technology*. London ; New York: Routledge.

Feenberg, Andrew, and Andrew Feenberg. 2002. *Transforming Technology: A Critical Theory Revisited*. New York, N.Y: Oxford University Press.

Firth, John Rupert. 1957. *Papers in Linguistics, 1934-1951*. Oxford University Press.

Frankfurt, Harry G. 2005. *On Bullshit*. Princeton, NJ: Princeton University Press.

Gehrke, Sean, and Adrianna Kezar. 2015. 'Unbundling the Faculty Role in Higher Education: Utilizing Historical, Theoretical, and Empirical Frameworks to Inform Future Research'. In *Higher Education: Handbook of Theory and Research*, edited by Michael B. Paulsen, 30:93–150. Higher Education: Handbook of Theory and Research. Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-319-12835-1\\_3](https://doi.org/10.1007/978-3-319-12835-1_3).

Gunn, Andrew. 2018. 'Metrics and Methodologies for Measuring Teaching Quality in Higher Education: Developing the Teaching Excellence Framework (TEF)'. *Educational Review* 70 (2): 129–48.

<https://doi.org/10.1080/00131911.2017.1410106>.

<https://doi.org/10.1080/00131911.2017.1410106>.

Goodyear, Peter. 2015. 'Teaching as Design'. *HERDSA Review of Higher Education* 2: 27–50.

Goodyear, Peter, Lucila Carvalho, and Nina Bonderup Dohn. 2016. 'Artefacts and Activities in the Analysis of Learning Networks'. In *Research, Boundaries, and Policy in Networked Learning*, edited by Thomas Ryberg, Christine Sinclair, Sian Bayne, and Maarten de Laat, 93–110. Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-319-31130-2\\_6](https://doi.org/10.1007/978-3-319-31130-2_6).

Gough, Noel. 2004. 'RhizomANTically Becoming-Cyborg: Performing Posthuman Pedagogies'. *Educational Philosophy and Theory* 36 (3): 253–65. <https://doi.org/10.1111/j.1469-5812.2004.00066.x>.

Gourlay, Lesley. 2012. 'Cyborg Ontologies and the Lecturer's Voice: A Posthuman Reading of the "Face-to-Face"'. *Learning, Media and Technology* 37 (2): 198–211. <https://doi.org/10.1080/17439884.2012.671773>.

Gourlay, Lesley. 2015. 'Posthuman Texts: Nonhuman Actors, *Mediators* and the Digital University'. *Social Semiotics* 25 (4): 484–500. <https://doi.org/10.1080/10350330.2015.1059578>.

Gourlay, Lesley, and Martin Oliver. 2018. *Student Engagement in the Digital University: Sociomaterial Assemblages*. New York, NY: Routledge.

Hall, Gary. 2016. *The Uberfication of the University*. Minneapolis: University of Minnesota Press.

Hamilton, Edwards, and Andrew Feenberg. 2012. 'ALTERNATIVE RATIONALISATIONS AND AMBIVALENT FUTURES: A Critical History of Online Education'. In *(Re)Inventing the Internet: Critical Case Studies*. Rotterdam; Boston: SensePublishers. <http://site.ebrary.com/id/10546411>.

Hamilton, Edward, and Norm Friesen. 2013. 'Online Education: A Science and Technology Studies Perspective / Éducation En Ligne: Perspective Des Études En Science et Technologie'. *Canadian Journal of Learning and Technology / La Revue Canadienne de l'apprentissage et de La Technologie* 39 (2). <https://doi.org/10.21432/T2001C>.

Hayes, Sarah. 2019. *The Labour of Words in Higher Education: Is It Time to Reoccupy Policy?* Boston, UNITED STATES: BRILL.

<http://ebookcentral.proquest.com/lib/bham/detail.action?docID=5652191>.

Hillman, Thomas, Annika Bergviken Rensfeldt, and Jonas Ivarsson. 2020. 'Brave New Platforms: A Possible Platform Future for Highly Decentralised Schooling'.

*Learning, Media and Technology* 45 (1): 7–16.

<https://doi.org/10.1080/17439884.2020.1683748>.

HEFCE. 2016. 'Teaching Excellence Framework Year Two Additional Guidance'.

[http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/2016/201632/HEFCE2016\\_32.pdf](http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/2016/201632/HEFCE2016_32.pdf).

Iliadis, Andrew. 2015. 'Two Examples of Concretization'. *Journal of Media and Communication* 6: 86-95.

Jandrić, Petar, Jeremy Knox, Tina Besley, Thomas Ryberg, Juha Suoranta, and Sarah Hayes. 2018. 'Postdigital Science and Education'. *Educational Philosophy and Theory* 50 (10): 893–99. <https://doi.org/10.1080/00131857.2018.1454000>.

Jasanoff, Sheila, and Sang-Hyun Kim. 2015. *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. University of Chicago Press.

<https://doi.org/10.7208/chicago/9780226276663.001.0001>.

Kirkwood, Adrian. 2014. 'Teaching and Learning with Technology in Higher Education: Blended and Distance Education Needs "Joined-up Thinking" Rather than Technological Determinism'. *Open Learning: The Journal of Open, Distance and e-Learning* 29 (3): 206–21.

<https://doi.org/10.1080/02680513.2015.1009884>.

Komljenovic, Janja. 2019. 'Linkedin, Platforming Labour, and the New Employability Mandate for Universities'. *Globalisation, Societies and Education* 17 (1): 28–43.  
<https://doi.org/10.1080/14767724.2018.1500275>.

Knox, Jeremy, Ben Williamson, and Sian Bayne. 2019. 'Machine Behaviourism: Future Visions of "Learnification" and "Datafication" across Humans and Digital Technologies'. *Learning, Media and Technology*, June, 1–15.  
<https://doi.org/10.1080/17439884.2019.1623251>.

Leach, Joan. 2000. 'Rhetorical Analysis'. In *A Practical Handbook for Social Research*, by Martin Bauer and George Gaskell. London: SAGE Publications Ltd.  
<http://search.ebscohost.com.ezproxye.bham.ac.uk/login.aspx?direct=true&db=nlebk&AN=1099419&site=ehost-live>.

Lukács, Georg. 1990. *History and Class Consciousness: Studies in Marxist Dialectics*. London: Merlin.

Marcuse, Herbert. 1991. *One-Dimensional Man: Studies in Ideology of Advanced Industrial Society*. Boston: Beacon Press.

Matthews, Adam. 2019. 'Design as a Discipline for Postdigital Learning and Teaching: Bricolage and Actor-Network Theory'. *Postdigital Science and Education* 1 (2): 413–26. <https://doi.org/10.1007/s42438-019-00036-z>.

Matthews, Adam. 2020. 'Blurring Boundaries between Humans and Technology: Postdigital, Postphenomenology and Actor-Network Theory in Qualitative Research'. *Qualitative Research in Sport, Exercise and Health*, November, 1–15.  
<https://doi.org/10.1080/2159676X.2020.1836508>.



- Matthews, Adam, and Ben Kotzee. 2019. 'The Rhetoric of the UK Higher Education Teaching Excellence Framework: A Corpus-Assisted Discourse Analysis of TEF2 Provider Statements'. *Educational Review*, October, 1–21.  
<https://doi.org/10.1080/00131911.2019.1666796>.
- Matthews, Adam, and Ben Kotzee. 2020. 'UK University Part-Time Higher Education: A Corpus-Assisted Discourse Analysis of Undergraduate Prospectuses'. *Higher Education Research & Development*, January, 1–16.  
<https://doi.org/10.1080/07294360.2020.1713730>.
- McCowan, Tristan. 2017. 'Higher Education, Unbundling, and the End of the University as We Know It'. *Oxford Review of Education* 43 (6): 733–48.  
<https://doi.org/10.1080/03054985.2017.1343712>.
- McLuhan, Marshall. 2010. *Understanding Media: The Extensions of Man*. Repr. Routledge Classics. London: Routledge.
- Means, Alexander J. 2018. 'Platform Learning and On-Demand Labor: Sociotechnical Projections on the Future of Education and Work'. *Learning, Media and Technology* 43 (3): 326–38. <https://doi.org/10.1080/17439884.2018.1504792>.
- Mautner, Gerlinde. 2005. 'The Entrepreneurial University: A Discursive Profile of a Higher Education Buzzword'. *Critical Discourse Studies* 2 (2): 95–120.  
<https://doi.org/10.1080/17405900500283540>.
- Mayr, Andrea. 2008. *Language and Power: An Introduction to Institutional Discourse*. London; New York: Continuum.  
<http://www.dawsonera.com/abstract/9780826438171>.
- McEnery, Tony, and Andrew Wilson. 1996. *Corpus Linguistics*. 2nd ed. Edinburgh: Edinburgh University Press.

Özdem, Güven. 2011. 'An Analysis of the Mission and Vision Statements on the Strategic Plans of Higher Education Institutions'. *EDUCATIONAL SCIENCES*, 8.

Sankey, Michael. 2020. 'Putting the Pedagogic Horse in Front of the Technology Cart'. *Journal of Distance Education in China* 5: 46–53.

Selwyn, Neil. 2016. 'Minding Our Language: Why Education and Technology Is Full of Bullshit ... and What Might Be Done about It'. *Learning, Media and Technology* 41 (3): 437–43. <https://doi.org/10.1080/17439884.2015.1012523>.

Selwyn, Neil, Thomas Hillman, Rebecca Eynon, Giselle Ferreira, Jeremy Knox, Felicitas Macgilchrist, and Juana M. Sancho-Gil. 2020a. 'What's next for Ed-Tech? Critical Hopes and Concerns for the 2020s'. *Learning, Media and Technology* 45 (1): 1–6. <https://doi.org/10.1080/17439884.2020.1694945>.

Selwyn, Neil, Felicitas Macgilchrist, and Ben Williamson. 2020b. 'Digital Education after COVID-19'. *Techlash*. <http://der.monash.edu.au/lnm/wp-content/uploads/2020/06/TECHLASH-01-COVID-education.pdf>.

Selwyn, Neil, and Dragan Gašević. 2020. 'The Datafication of Higher Education: Discussing the Promises and Problems'. *Teaching in Higher Education* 25 (4): 527–40. <https://doi.org/10.1080/13562517.2019.1689388>.

Spector, J. Michael. 2002. 'Foreword'. In *Networked Learning: Perspectives and Issues*, edited by Christine Steeples and Chris Jones. Computer Supported Cooperative Work. London ; New York: Springer.

- Srnicek, Nick, and Laurent De Sutter. 2016. *Platform Capitalism. Theory Redux*. Cambridge, UK ; Malden, MA: Polity Press.
- Stefanowitsch, Anatol. 2020. *Corpus Linguistics: A Guide to the Methodology*. Zenodo. <https://doi.org/10.5281/ZENODO.3735822>.
- Sutherland, Will, and Mohammad Hossein Jarrahi. 2018. 'The Sharing Economy and Digital Platforms: A Review and Research Agenda'. *International Journal of Information Management* 43 (December): 328–41. <https://doi.org/10.1016/j.ijinfomgt.2018.07.004>.
- Ulmer, Jasmine B. 2017. 'Posthumanism as Research Methodology: Inquiry in the Anthropocene'. *International Journal of Qualitative Studies in Education* 30 (9): 832–48. <https://doi.org/10.1080/09518398.2017.1336806>.
- Williams, Robin, and David Edge. 1996. 'The Social Shaping of Technology'. *Research Policy*, 35.
- Williamson, Ben. 2017. *Big Data in Education: The Digital Future of Learning, Policy and Practice*. 1st edition. Thousand Oaks, CA: SAGE Publications.
- Williamson, Ben. 2019. 'The Platform University: A New Data-Driven Business Model for Profiting from HE'. Wonkhe (blog). 2019. <https://wonkhe.com/blogs/the-platform-university-a-new-data-driven-business-model-for-profiting-from-he/>.
- Williamson, Ben, John Potter, and Rebecca Eynon. 2019. 'New Research Problems and Agendas in Learning, Media and Technology: The Editors' Wishlist'. *Learning, Media and Technology* 44 (2): 87–91. <https://doi.org/10.1080/17439884.2019.1614953>.
- Williamson, Ben. 2020. 'Making Markets through Digital Platforms: Pearson, Edu-Business, and the (e)Valuation of Higher Education'. *Critical Studies in Education*, March, 1–17. <https://doi.org/10.1080/17508487.2020.1737556>.

Williamson, Ben, Rebecca Eynon, and John Potter. 2020. 'Pandemic Politics, Pedagogies and Practices: Digital Technologies and Distance Education during the Coronavirus Emergency'. *Learning, Media and Technology* 45 (2): 107–14. <https://doi.org/10.1080/17439884.2020.1761641>.

Williamson, Ben, Sian Bayne, and Suellen Shay. 2020. 'The Datafication of Teaching in Higher Education: Critical Issues and Perspectives'. *Teaching in Higher Education* 25 (4): 351–65. <https://doi.org/10.1080/13562517.2020.1748811>.

Wyatt, Sally. 2008. 'Technological Determinism Is Dead; Long Live Technological Determinism'. In *The Handbook of Science and Technology Studies*, edited by Edward J. Hackett and Society for Social Studies of Science, 3rd ed. Cambridge, Mass: MIT Press : Published in cooperation with the Society for the Social Studies of Science.