It's not all about the learner: reframing students' digital literacy as sociomaterial practice

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Abstract

Digital literacies are an important area of contemporary research and practice. However, policy and research on this topic relies almost exclusively on capability or competence models of "digital literacy". These decontextualised, cognitive accounts ignore the insights of New Literacy Studies (e.g. Lea & Street, 1998), which have shown that focusing on a 'free floating' learner, without reference to settings, resources and cultures, fails to explain important aspects of how literacy practices are achieved and enacted.

Adopting a sociomaterial account of learning provides an alternative to these narratives about student literacy. From this perspective, 'literacy' is an achievement that involves the successful coordination of human and non-human actors – including teachers, other learners, pupils, devices, texts and so on. Drawing on work undertaken as part of a JISC-funded project, we critique mainstream 'learner-centred' accounts of digital literacy; outline the theoretical framework on which our work has been based; and present a series of case studies that show how an individual's ability to act in a digitally literate way depends on much more than an assumed set of stable, internalised qualities. These cases involve data collected by students through multimodal journalling over a period of 9-12 months, and from in-depth interviews that explored what these meant to them.

This analysis shows how learners' practices are shaped by the social and material environments in which they are enacted, and reveals that learners are engaged in an ongoing, improvisatory process of both adapting to the environments in which they work, whilst also adapting these environments.

Keywords

Digital Literacies, Sociomateriality, Actor-Network Theory, Higher Education

Introduction

> Removing the agency of texts and tools in formalising movements risks romanticising the practices as well as the humans in them; focusing uniquely on the texts and tools lapses into naïve formalism or techno-centrism. (Leander and Lovvorn 2006: 301)

This paper develops a critique of dominant contemporary accounts of "digital literacies". It identifies recent developments in this discourse, and examines the assumptions and characteristics of two widely cited models of digital literacy. These are then considered in relation to two theoretical traditions of work: New Literacy Studies and Sociomateriality. This examination is followed by data from an empirical study that involved longitudinal, multimodal data production and interviews with a dozen students from one Higher Education Institution. The analysis of this data shows that digital literacy cannot be adequately understood from a purely decontextualized, cognitive account of learners, but needs to account for the material and social networks in which practices are enacted.

Digital literacies

It is generally accepted that the term 'digital literacy' was coined by Glister, who defined it as '...the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers' (1997:1). The concept has subsequently been developed by a range of researchers and commentators (e.g. Lankshear & Knobel 2008, Carrington & Robinson 2009, Goodfellow & Lea 2013). It is beyond the scope of this chapter to provide a comprehensive literature view of this complex field; instead we will focus on recent attempts to define student digital literacies, showing how these attempts have relied primarily on taxonomies or lists of features.

Several models of 'digital literacies' have arisen in recent years, and these have been influential in shaping policy, development and research. In many ways, these models represent an advance in mainstream thinking

about this very complex area of student practice, in that they have served to shift the focus of work towards the learner, rather than the technology (Glister, 1997; Bawden, 2008). However, this original emphasis on "the ideas and mindsets, within which particular skills and competences operate, and […] information and information resources, in whatever format" (Bawden, 2008: 19) has since been obscured by other, more technology-oriented definitions, even though "these formulations still tend to focus on technical 'know-how' that is relatively easy to acquire and on skills that are likely to become obsolete fairly rapidly" (Buckingham, 2008: 77).

We argue that this drift towards technical formulations is a mistake, even when it is framed in a 'student-centred' manner. In seeking to define digital literacies in terms of capabilities or features of learners, the field is in danger of losing sight of important aspects of student engagement with technologies as revealed by recent research. In order to explore this issue, we can trace how these discussions have shaped, and in turn been shaped by, national level policies and funding within the UK.

Our point of departure for this discussion is the definition provided by the European Union-funded DigEuLit project, which has proved influential in subsequent attempts to break the concept down into constituent parts:

> Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process. (Martin & Grudziecki, 2006: 255)

This is a broad definition, appearing to cover all areas of contemporary digitally-mediated life, as opposed to restricting itself to notions of meaning. In an attempt to encapsulate what is meant by the term, Martin and Grudziecki employ a long list of active verbs related to 'digital resources'. This marks a subtle shift away from Glister's 'information'. However, their emphasis remains on the creation of knowledge and on communication, with an acknowledgement of the connection between this and 'social action'. Once more, however, these practices remain 'free floating'; although there is mention of specific situations, the list given remains ungrounded, unmodulated by the range of ways in which these verbs might be enacted.

Building on this EU definition, Beetham (2010) developed a model as part of a scoping exercise for a large programme of UK government-funded development in universities (JISC 2011). Because of its position as a foundational point of reference for a programme of funded research, it has become particularly influential in the UK. Beetham provided the following definition: 'Digital literacy defines those capabilities which fit an individual for living, learning and working in a digital society'.

What is striking about Beetham's definition is the continued expansion of its scope, with the term no longer focused on digitally-mediated meaning-making, but on all spheres of activity in 'a digital society'. This may reflect its position in shaping a national-level programme, one that needed to remain inclusive and open at the point of specification. This definition is accompanied by a model structured in four layers. Each layer is seen as resting on the preceding layer (often represented as a pyramid), with 'access' at the base, seen as the first step in "a developmental sequence" (Sharpe & Beetham, 2010: 88), to be followed by 'skills', 'social practices' and finally 'identity'.

This model is insightful in many respects, as it acknowledges the multiple dimensions of this complex phenomenon, and the need for practical access and activities for engagement. It is worth focusing on the continued use of the word 'skills', however. This is a controversial term to employ in a definition of 'literacies': the foundational definition of 'academic literacies' (Lea and Street 1998) rest on the explicit rejection of the then-prevalent 'skills' model of student communication, which was critiqued as being insufficiently focused on social, disciplinary and individual practices and identities. It is also noteworthy that these elements are constructed as (con)sequential and hierarchical in their nature, with one seen as resting on another in what appears to be a causal configuration. The assumption also seems to be that each of these are steps is taken in ascending order of complexity, with identity appearing almost as a 'product' of the preceding levels of engagement. Whilst this may appeal to common-sense notions of what these concepts denote, it could equally be argued that 'access' flows from identity or cultural capital (Bourdieu 1986). Indeed, as Bennett argued after working with this model (2014), although academics' identities as teachers might drive engagement with specific social practices, few academics followed a linear progression from seeking access towards the development of a 'digital practitioner' identity.

Additionally, separating 'social practices' from other categories is highly problematic, as this term arguably subsumes all of the others - for example, ‘access’ (or the lack of it) only makes sense in terms of access to something, for some purpose; in other words, it becomes meaningful as part of social practice. A further point of critique is that identity work permeates all aspects of digital engagement, whether 'basic' or 'advanced'.

Finally, the development of the model from prior empirical work has, arguably, involved category shifts and changes of emphasis that have not been theoretically or empirical driven, but which contribute to the separation of model from specific situated practices. For example, the original derivation of the levels was a response to learners’ accounts of enablers and barriers to their development (Sharpe *et al*, 2009: 16) – these were specific, but the specificity is hidden by the abstract terminology of the model. Further, the pinnacle level was expressed in terms of learners’ conceptions, and labelled ‘creative appropriation’ rather than ‘identity’. The shift to identity was justified partly in relation to Maslow’s hierarchy of needs by drawing an analogy with self-actualization, with the original label becoming less and less visible over time. This development was not driven nor explicitly informed by theories of subjectivity or identity, however. Consequently, although the model has been influential, and may well be useful heuristically, it remains problematic as an account of students’ digital literacies, not least because of the growing drift that can be traced in its development away from specific situated practices.

Another model which has arisen in recent years was formulated by Belshaw (2011). This model proposes that there are 'Eight Elements' of digital literacies, namely: Cultural, Cognitive, Constructive, Communicative, Confident, Creative, Critical, Civic.

The first noteworthy point is that his use of the term 'essential elements' appears to explicitly reference the periodic table of chemical elements, as can be seen this slide taken from a presentation available online (Figure 1; Belshaw 2012):

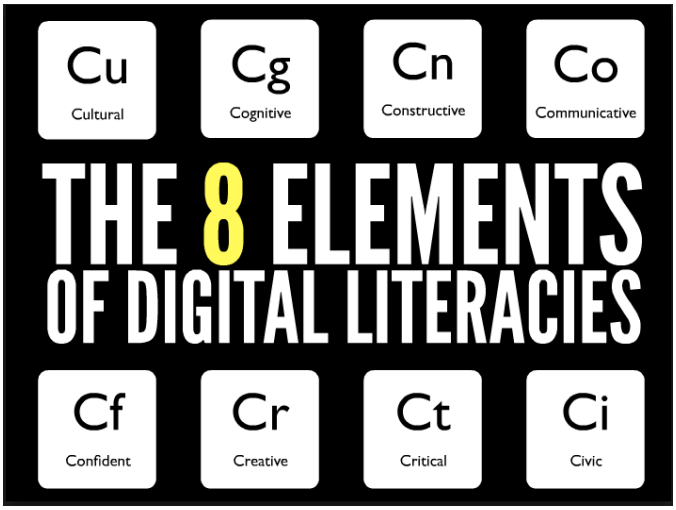

Figure 1: Belshaw’s 8 elements of digital literacies

Although Belshaw is clearly employing a lighthearted and engaging metaphor, we argue that his choice of metaphor is worth exploring more seriously, since its still influences discussions in this area. It rests on the notion that ‘Digital Literacies’ is a composite, or a substance made of a combination of all of these elements; consequently the elements are posited as essential, distinct, and amenable to precise definition and delineation. This invites contestation. For example, it could immediately be argued that the concept of 'cultural' contains within it the notion of 'civic'. Indeed, the terms used in the model are all contestable, blurred and open to multiple definitions – and in that respect are very far from 'essential'.

Linking back to the analysis of Beetham’s model, it is also worth noting that the 'elements' all consist of a wide-ranging set of adjectives which refer to qualities often regarded as positive and desirable in students in higher education, none of which are grounded in specific situations. Although it should be recognised that the development of ‘the whole person’ has long been regarded as an outcome of higher education, these tended to focus on higher-order abilities in academic reasoning and self-expression. In contrast, it can be argued that the contemporary conception of ‘graduate attributes’ bears a relationship to dominant discourses which place emphasis on the university’s role in preparing graduates for the workforce. Viewed through this lens, aspects of

the list is reminiscent of rather aspirational 'graduate attributes', and defines literacies in terms of the individual as a bundle of descriptive attributes as opposed to focusing on practices. Such conceptions have been widely contested, both for their coherence and also for the highly political way in which they reposition relationships between Higher Education, employers and wider society; they hinge on the promise of unproblematic transfer of skills between situations (e.g. Atkins, 1998).

Questions can also be asked about the status of practices that incorporate some but not all of the elements. According to this model, for example, an under-confident student writing an essay using online sources may not be engaged in 'digital literacies', as one of the 'essential elements' (confidence) is missing. Whilst it might be possible to use this in a diagnostic way – for example, looking for practices that are more complete than others – the model has not been used in that situated way, and can thus be interpreted instead as an ideological wish-list that positions a student as a particular kind of subject, but does not refer to meaning-making practices - or indeed to 'the digital' - directly.

Common features can be seen in both of these analyses; arguably, these models, and others like them, exhibit several similarities. Firstly, despite having been derived from empirical research, arguably the nuanced nature of the data has been rendered less visible in the move to abstract 'transferable' models. This creates an impression that digital literacies are in some sense quantifiable, relatively stable, generic and transferable entities: i.e. that they are taxonomic, not simply in the sense of being a well-structured classification, but carrying connotations of platonic or transcendental qualities, abstracted away from any specific, situated instance. As a result, such models can create an impression of digital literacies as abstract entities, whose defining features can be identified as residing in the individual. This we would argue is a particular issue when such frameworks come to be associated with neoliberal agendas around 'graduate attributes'.

This idea of learners as individuals carrying stable properties can be further critiqued by drawing on Friesen's analysis of the influence of the US military on e-learning (2010). The close association of military agendas and funding in the development of e-learning as a field are reflected, he argues, in the metaphors 'encoded' within learning systems. He points in particular to the 'closed systems' model that arose from Cold War concerns about the design of systems that demonstrated "survivability". In such models, networks are framed as closed systems in which the learner becomes a component: learners become part of a "man-computer symbiosis".

> The representation of the learner—"student, technician, laborer, professional, warfighter, anyone!"—as a mere organ is perhaps the strongest illustration of this. The human learner is depicted, in effect, as a specialized, functional component interposed in a much larger electronic system. (Friesen, 2010: 77)

As a functional component, the development of 'digital literacies' takes on a very different tone, not as a student-centred expression of agency, but as a concern with re-engineering a substandard component in order to foster the efficient operation of wider technical systems. From this perspective, the creation of a stable, abstract taxonomy of digital literacies takes on clear politics, repositioning graduates as standardised components in corporate systems, not as valued individuals in their own right.

It is also worth noting that models such as those offered by Beetham and by Belshaw are composed of a combination of cognitive acts, attitudinal states, capabilities and attributes. Qualitative adjectives are used, which we would argue feeds the underlying ideology of the graduate as a quality-assured 'product'. Ironically, given that much of the original work was learner-centred, there is then a danger that the ongoing use of such models can result in learners and their situated digital practices being occluded. In order to theorise our critique, we will refer to two bodies of literature and theory in the following two sections - New Literacy Studies and Actor-Network Theory.

New Literacy Studies

The notion of 'academic literacies' was proposed by Lea & Street (1998) as an explicit challenge to the dominant 'skills' paradigm of student writing and communication. This perspective came out of a broader strand of work known as New Literacy Studies (NLS) (Barton, 2007), and sees student writing and other forms of communication as situated social practices centred on meaning-making. Textual practices of all kinds (linguistic, verbal, multimodal involved in reading, writing and speaking) are positioned as central to students' study practices and lives. In this perspective (which has its roots in social anthropology and applied linguistics), cultural, disciplinary and individual practices and texts are seen as fundamentally unstable and in flux. They are also seen as context-specific and under ongoing contestation.

The emphasis within this tradition of research is on social actors, involved in joint engagement via struggles for meaning-making which are seen as co-constitutive of identities and learning. This reflexive relationship between textual media and knowledge practices in higher education has been recognised in media theory (e.g. Kittler 2004). Since the academic literacies model was developed, the media systems of the university have changed significantly, leading to a situation where the material campus is now largely saturated with digital mediation, and the status of 'face-to-face' as a non-digital category has been placed in radical doubt (e.g. Gourlay 2012). There has been a recognised need to explore the ramifications of devices and digitally-mediated semiotic practices on meaning making. NLS has responded to this with a series of studies and publications which seek to apply this theoretic perspective to the digital (e.g. Lankshear & Knobel 2008, Goodfellow & Lea 2013). An NLS definition illustrates the contrast between this conception and those described above. Gillen and Barton define digital literacies as 'The constantly changing practices through which people make traceable meanings using digital technologies' (2010: 9). The emphasis here is still on situated social practices and meaning-making, rather than decontextualized characteristics of learners.

We will argue with reference to our data that this model reflects more accurately the experiences of students engaged with technologies in their studies, and will propose that this emphasis on situated meaning-making should be present in mainstream definitions and accounts of digital literacies. However, we would like to add a further theoretical strand to this critique. Although the NLS perspective restores the focus on meaning-making and situated practices, arguably, it does not adequately theorise digitally-mediated semiotic practices, in particular the relationship between the student, text and device, the multiply-distributed nature of digital literacies and the materiality of literacy practices (Gourlay, Lea & Hamilton, 2013).

Sociomaterial perspectives

Work on the materiality of practice has been developed within the context of Actor-Network Theory. For example:

> If you can, with a straight face, maintain that hitting a nail with and without a hammer, boiling water with and without a kettle...are exactly the same activities, that the introduction of these mundane implements change 'nothing important' to the realisation of tasks, then you are ready to transmigrate to the Far Land of the Social and disappear from this lowly one. (Latour 2005: 71)

In this quote, Latour prompts us to notice the crucial but often overlooked role of material objects - or 'nonhuman actors' - in everyday processes. These material assemblages are similarly overlooked in educational theory, as Fenwick et al point out:

> Humans, and what they take to be their learning and social process, do not float, distinct, in container-like contexts of education, such a classrooms or community sites, that can be conceptualised and dismissed as simply a wash of material stuff and spaces. The things that assemble these contexts, and incidentally the actions and bodies including human ones that are part of these assemblages, are continuously acting upon each other to bring forth and distribute, as well as to obscure and deny, knowledge. (Fenwick et al, 2011: vii)

Latour sees technologies as 'mediators', rather than as intermediaries. This distinction is important in explaining both the distinctive status of 'digital literacies' as a category of practices, but also in explaining why attempts to abstract from social practices to taxonomic categories are problematic.

For Latour, an intermediary is '…what transports meaning or force without transformation: defining its inputs is enough to define its outputs', while mediators 'transform, translate, distort, and modify the meaning or the elements they are supposed to carry' (Latour, 2005: 39). Latour notes the tendency of groups to position tools as intermediaries when they wish to draw attention away from their operation, naturalising them; whereas he argues that intermediaries are "not the rule, but a *rare* exception that has to be accounted for" (p40). This is as important in academic practices as it is elsewhere.

> Almost all of our interactions with other people are mediated through objects of one kind or another. For instance, I speak to you through a text, even though we will probably never meet. And to do that, I am tapping away at a computer keyboard. At any rate, our communication with one another is mediated by a network of objects – the computer, the paper, the printing press. And it is also mediated by networks of objects-and-people, such as the postal system. The argument is

> that these various networks participate in the social. They shape it. In some measure they help to overcome your reluctance to read my text. And (most crucially) they are necessary to the social relationship between author and reader. (Law, 1992: 380)

This perspective offers theoretical purchase on the materiality of devices and technologies in a way NLS has not done until now (see Gourlay, Hamilton and Lea, 2013). This allows us to see digital literacies as emergent through networks of human and nonhuman actors (collectively referred to as actants) and constitutive of 'context', spaces and places. It is this perspective that motivated and informed the study that follows.

Methodology

In order to study students' use of digital technologies in their studies, a nested design was adopted, as part of a JISC-funded project undertaken at a large UK postgraduate institution specialising in Educational research. The student body at the institution is predominantly mature and postgraduate, and many combine study with work and family responsibilities. Students are from diverse countries of origin and a broad range of education cultures. Most have been out of formal education for several years. Consequently, they may never have used the kinds of digital technologies that are regarded as mainstream in higher education, although they have well-established repertoires of digital practices developed in personal or professional settings.

The first phase of research, a secondary analysis of existing data on student satisfaction, identified preliminary areas of practice and concern, but lacked detail. However, it highlighted differences in experience between groups of students following distinct programmes of study. This was used to design the second phase: four focus groups, one each with students following PGCE courses (the UK qualification to teach in compulsory education), taught Masters courses, taught Masters courses studied at a distance, and doctoral students. Participants were recruited to ensure diversity of gender; age; home/EU or international and full-time/part-time status. All participants were studying education-related topics (including pedagogy, the economics of education, educational development, etc). Each focus group opened by inviting students to sketch the places in which they studied and the resources they used; this formed the point of departure for the focus group discussions. Transcripts from the focus groups were analysed thematically, revealing that study took place in diverse settings; using a broad array of technologies; and involved extensive use and production of (multimodal) texts, with the University library playing an important role in the provision of these. This was used to structure the third phase of work, which forms the basis of the analysis offered in this paper.

The final empirical phase of the project was a longitudinal study. Three students from each group (see Table 1) assembled multimodal journal records of their day-to-day practices and interactions with texts and technologies in a range of settings, producing images, videos and textual notes of everyday objects and processes. These were discussed in an iterative series of 3-4 interviews, over a period of around nine months, so that the images and artefacts served not only as objects of analysis, but also as stimulus for in-depth exploration of subjectivities, challenges and issues, following an 'Interview plus' approach (Mayes, 2006). (Students studying at a distance were interviewed over Skype, with discussions referring to previously-shared digital resources.) Participants were encouraged to focus on the 'messy' micro-level day-to-day lived activities, networks and the material/spatial aspects of practice. This was meant to help them move beyond neat, decontextualised accounts of the kind that can be generated in stand-alone interviews, where interviewees can find themselves making abstractions rather than retelling specifics (Gourlay 2010).

Table 1: Participants in the journaling study

Pseudonym	Category	Gender	Nationality
Bokeh	Distance Masters	M	British
Danny	Distance Masters	M	British
Django	PhD	F	British
Faith	PGCE	F	Taiwanese
Frederick	PhD	M	German
Juan	Masters	M	British
Lara	Distance Masters	F	British
Louise	PGCE	F	British
Nahid	Masters	M	Bangladeshi
Polly	PGCE	F	British
Sally	PhD	F	British
Yuki	Masters	F	Japanese

The first interview explored students' current practice, invited a 'digital biography' covering historical uses of technology for learning and introduced the devices to be used for data collection. The 'Interview plus' component for this initial discussion involved asking students to draw maps of their study practice, building on the approach used for the focus group, and then developing this through the interview by asking questions about the networks and devices used in different domains; the associations between spaces, tasks and times; the resources drawn upon; feelings of support, control or frustration; and so on. The subsequent interviews focused on themes and issues identified in the focus groups, including use of the VLE and the library, and the consumption and production of study-related texts. Across the course of the interviews students took increasing responsibility for curating, presenting and analysing their own data, adding a layer of interpretation to the dataset. The interviews were transcribed, and transcripts were mapped to the images, videos and resources that students discussed. This multimodal dataset was analysed thematically, drawing on visual methodologies (e.g. Rose, 2012) to interpret images and videos further. The study received institutional ethical clearance and followed approved procedures for informed consent, including guarantees of anonymity and confidentiality, and the right to opt out at any point.

Findings

Not free-floating

Students' interviews provided powerful accounts of the ways in which their ability to act in meaningful ways were impeded by the situations in which they were placed. For example, one PGCE student described how her ability to print materials for a class was impeded not through some lack of skill, but through issues of professional identity (and the cultural capital that represents) that set priorities for access:

> In my school […] our staff room was equipped… one, two, three, four, five, six, seven… seven computers now we can use and only one of them attached with a printer. So, actually we've got six PGC students over there, so it's, kind of, everybody wants to get to that computer where you can use the printer. […] So, it, kind of, sometimes feels a bit crowded. And when the school staff want to use it, well, okay, it seems like we are the invaders, intruders? (Faith, Interview 2)

In terms of the models reviewed earlier, 'access' here was problematic, rendering irrelevant Faith's 'skills', by denying her the material resources required for her to enact social practices. Rather than being hierarchical, this situation cut across the foundations of the 'pyramid' model. Belshaw's model appears to fare better, in that this situation appears to fail in terms of 'cultural' or perhaps 'civic' elements; however, Faith's solution (to use a printer in the school library intended for pupils) arguably demonstrates digital literacy, without repairing either of those broken elements.

Not taxonomic

Participants identified a wide range of technologies used to support study. These included:

- Office tools (primarily Microsoft, plus Google docs and Prezi)
- Institutional VLEs (Moodle and Blackboard)
- Email (institutional, personal and work-based)
- Synchronous conferencing services (Skype, Elluminate)
- Calendars (iCal, Google)
- Search engines and databases (including Google, Google Scholar, library databases, professional databases such as Medline, etc),
- Social networking sites (Facebook, Academia.edu, LinkedIn) and services (Twitter)
- Image editing software (photoshop, lightbox)
- Endnote
- Reference works (Wikipedia, online dictionaries and social bookmarking sites such as Mendeley)
- GPS services
- Devices (PCs at the institution and at home, laptops including MacBooks, iPhones, iPads, Blackberries and E-book readers)

Importantly, however, no participant used everything from the list. Each worked with a subset that was relevant to them, and moreover, used different technologies at different points in their studies. (Data analysis tools were an obvious example of this, only becoming relevant during and after empirical work.)

This means that any simple functional, taxonomic list would be partial (other students may well use different resources and services), over-inclusive (for example, GPS was relevant to students undertaking fieldwork but not others), plagued by problems of granularity (should Facebook, Academia.edu and Twitter all be counted as 'social networking', or classified separately?) and time-bound (expertise in earlier versions of SPSS was no guarantee of being able to use current versions). Lists may therefore make sense in relation to a particular data set, or provide some heuristic value, but their status as taxonomies cannot be justified.

Not just human

The use of maps and images to ground the interviews generated rich accounts of a range of actants that were attributed with agency in relation to their studies.

> My third half of my brain is Google scholar. (Frederick Interview 2)

This kind of example led to rich descriptions of the kinds of heterogeneous networks that students relied upon – and were implicated in – in order to study successfully.

> …It's not necessarily the working with, sort of, the traditional practices, but much more about the, you know, our physical bodies in space, rather than… And thinking about online environments as being… the iPhone, or whatever it is, connected to a projector, or working then with the iPad, and connecting, so you've got this kind of circuit within a physical space. (Django Interview 1)

Following the principle of symmetry, not all such actants were viewed positively; some participants provided accounts of struggles or dependency rather than enhancement.

> I think they (the technologies) control me as well, because I can't really do anything without them (Faith Interview 1)

Some participants went so far as to describe technologies as malevolent, raising particular concerns about the ways in which they would take and distribute personal information, for example.

> I feel like, also that Google is equally watching you. You know, they're all watching you, they're all trying to sell you things […] You know, I don't want my friends to spy on me, I don't want my friends to know what I listen to on YouTube. (Sally Interview 1)

Not just digital

Whilst students' accounts presented a picture of study as digitally saturated, non-digital resources remained important. Some students found that they supported particular practices, such as annotation, better than digital technologies currently do; they also carried emotional resonance for them.

> My favourite way of studying something is sitting down with a book and…a pen and some yellow paper and taking notes…. And then I will use the technological side as well, because… Yes, I like combining the two, but I also like to be… the demarcation lines between them, you know, if I, if I have a reading to do then I can, then I almost, I invariably print it off and highlight. (Juan, Interview 1)

This 'demarcation' was important: moments at which texts passed from printed to digital, and from digital to print, were important in the study process. These included shifts in practice (such as moving from skimming to reading in depth) and in status (such as from raw data to a form suitable for analysis; or from draft to final, bound and submitted dissertation).

Nor were the networks that students created made purely of material resources and tools; other people played important parts in supporting studying, too. Participants identified tutors, librarians and fellow students as contributing to their studying, in ways that ranged from formal feedback to informal encouragement.

> The student bar we would go to quite often, because it would be the same group of people that usually all work in a library. […] You know it was fluid enough that people who worked in different places, but you would invariably bump into people, and sort of go how's it going? How's

> your dissertation? So that event I think was really important. A sort of peer support, whatever, but it being still quite informal, quite casual. (Juan, Interview 4)

Again, accounts that focus purely on individuals in isolation risk ignoring important roles that others play in studying successfully.

Co-constituted spaces

The sketched maps and images created as data by participants drew attention to the range of spaces that they used for study. As with texts, both digital and physical spaces remained important, with moves between the two signalling important moments of transition. Again, participants described emotional responses to different environments.

> I'll only work at the computer usually to actually do the final part of writing an essay. I enjoy… the image of being, sort of, in a dusty, you know, sort of, wooden shelved, kind of, old library, where it's, sort of, cosy and warm, that's, you know, I like that and that's a part of the experience of studying that I enjoy. (Juan, interview 1)

A recurrent theme was well summed up by the title one participant gave to her montage of images (Figure 2): "less bound by place".

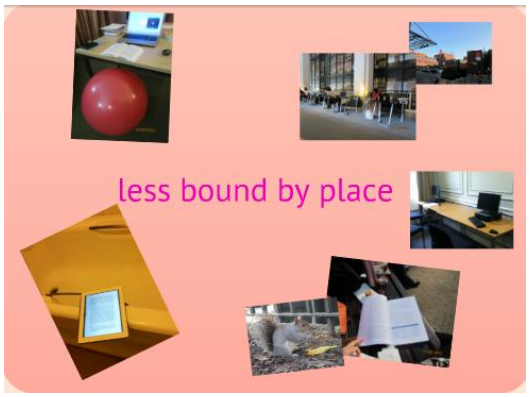

Figure 2: A students' curated image data showing the variety of places where they study

For some of the participants, the portability of devices meant that they could create spaces for study in lots of different locations; this led to a romanticising of the digital as transcending the physical.

> That's really interesting how much I use the iPad for a start everywhere and anywhere...And I have the information there all the time constantly, and I just feel as though I don't have to be anywhere physical at all anymore... (Django, Interview 3)

However, as the frequent accounts of studying on public transport demonstrated, students were not 'free' of spaces; instead, they were better able to create study spaces, to engineer the conditions they needed to study. This usually involved digitising or collating texts, carrying them around, then unpacking them in new locations (e.g. getting out an iPad on a train) so as to make use of them. This sense of being "less bound" was achieved through careful preparation and the purchase of devices (iPads, laptops, ring binders) that helped curate resources. Moreover it was not always successful; participants who used cloud-based file storage were not always able to access this whilst on the move, for example.

Discussion

The cases presented above show some of the complexity of students' study practices, and importantly, demonstrate that simply considering individuals in isolation cannot explain whether or not they should be classified as 'digitally literate'. Existing models of digital literacies do go some way towards recognising this complexity – for example, Beetham's model recognises that access is important, pointing to some degree towards the materiality of social practice; similarly, Belshaw's elements draw attention to the positioning of practice within wider social contexts.

However, drawing on a sociomaterial perspective may help to draw attention to the ways in which students work to create heterogeneous networks of things and people in order to study. The distributed, often private, nature of studying made conventional ethnographic approaches to "follow the actors themselves" (Latour, 2005: 12) impractical to implement, but the rich, longitudinal and multimodal narratives that participants provided allowed such trajectories to be recreated in sufficient detail to appreciate the complexities of their practices. This has demonstrated that technologies do indeed act as mediators, rather than intermediaries, for the academic texts with which students are working. Whether this was the convenience and connectivity that iPads provided, the seriousness and focus that learners associated with research libraries, or the way that post-it notes and marker pens were used to layer meanings onto printed copies of articles, the spaces, tools and technologies that learners worked with contributed to the kinds of texts they were able to produce.

As a result, it is unsurprising that some participants saw their academic self as partially constituted by the technologies, space and services that they drew upon. Rather than 'identity' emerging as an epiphenomenon above a layer of social practice, learners such as Fredrick described themselves as enmeshed with technologies in a manner more akin to Harraway's cyborgs (1991) than to the military, command-and-control circuits that Freisen critiques (2010). This has implications for the unit of analysis for research on digital literacies. As Bhatt and de Roock have argued, focusing on "digital literacy events" rather than on individuals in the abstract may make more sense of the complex, emergent sociomaterial practices that constitute studying, even if it does little to aid in the production of standardised, quality-assured graduate 'components'.

Conclusions

The importance of learning and cognition is undeniable in seeking a comprehensive account of how learners move into new contexts and apply and adapt literacies. However, mainstream accounts of digital literacy tend to create an impression of learners as 'free floating', idealised agents, unencumbered by material concerns. These accounts have been valorised as learner-centred. While this focus on learners is undoubtedly important, the critiques advanced in the first section of this paper, drawing on NLS and Actor-Network Theory, suggest that accounts that ignore the settings in which learners try to study can risk inadvertently promoting a neo-liberal agenda that frames graduates as individualised products. By contrast, taking a sociomaterial perspective provides a fine-grained characterisation of social practices, one that reveals the situated complexity of acting in a digitally literate way.

The study presented here used qualitative data generated by and with students, which in our analysis we argue undermines the validity of such decontextualised accounts. Analysing these empirical cases using concepts drawn from sociomaterial theory demonstrated that, for these students, successful study involves the creation and coordination of sociomaterial assemblages that span material and digital alike. This was particularly visible in the acquisition, curation, destruction and creation of texts, especially as part of assessed work. While existing spaces (the library, home) were confirmed as important sites for study, participants' accounts of the adaptation of existing spaces – whether a seat on a train, a laptop on a sofa or books on a library desk – emphasised the dynamic, improvised and even ephemeral nature of these achievements.

In doing so, it demonstrates that learner-centeredness need not lead to neglect of sociomaterial considerations. This has implications for future work: close study is needed of students' experiences, including the resources they work with and the settings they create.

References

Atkins, M. (1999). Oven-ready and self-basting: taking stock of employability skills. *Teaching in Higher Education, 4* (2), 267-280.

Barton, D. (2007) *Literacy: An introduction to the ecology of written language* (2nd edition). Oxford: Blackwell.

Bawden, D. (2008) Origins and concepts of digital literacy. In Lankshear, C., & Knobel, M. (Eds.), *Digital literacies: Concepts, policies and practices*, 17-32. New York: Peter Lang.

Beetham, H. (2010) Review and Scoping Study for a Cross-JISC Learning and Digital Literacies Programme. JISC, www.jisc.ac.uk/media/documents/funding/2011/04/Briefingpaper.pdf

Belshaw, D. (2011) What is 'digital literacy'? A pragmatic investigation. Doctoral Thesis, Durham University. http://neverendingthesis.com/doug-belshaw-edd-thesis-final.pdf

Bennett, L. (2014) Learning from the early adopters: developing the Digital Practitioner. *Research in Learning Technology*, 22, 1-13.

Bourdieu, P. (1986) The forms of capital. In J.G. Richardson's *Handbook for Theory and Research for the Sociology of Education*, pp. 241–258. New York: Greenwood Press.

Buckingham, D. (2008) Origins and concepts of digital literacy. In Lankshear, C., & Knobel, M. (Eds.), *Digital literacies: Concepts, policies and practices*, 73-89. New York: Peter Lang.
Carrington, V. & Robinson, M. (2009) *Digital Literacies: Social learning and classroom practices*. London: Sage.
Fenwick, T., Edwards, R. & Sawchuk, P. (2011) Emerging Approaches to Educational Research: Tracing the Sociomaterial. London: Routledge.
Friesen, N. (2010) Ethics and the technologies of empire: e-learning and the US military. *AI & society*, *25* (1), 71-81.
Gillen, J. & Barton, D. (2010) Digital Literacies: A Research Briefing by the Technology Enhanced Learning Phase of the Teaching and Learning Research Programme. London: London Knowledge Lab. http://www.tlrp.org/docs/DigitalLiteracies.pdf
Glister, P. (1997) *Digital Literacy*. John Wiley and Sons.
Goodfellow, R. & Lea, M. (2013) *Literacy in the Digital University: Critical perspectives on learning, scholarship and technology*. London: Routledge.
Gourlay, L. (2012) Cyborg ontologies and the lecturer's voice: a posthuman reading of the 'face-to-face'. *Learning, Media and Technology* 37 (2), 198-211.
Gourlay, L., Hamilton, M. & Lea, M. (2013) Textual practices in the new media digital landscape: messing with digital literacies. *Research in Learning Technologies*, 23, 1-13.
Haraway, D. (1991) A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century. *Simians, Cyborgs and Women: The Reinvention of Nature*. London: Routledge.
Kittler, F. (2004) Universities: wet, hard, soft and harder. *Critical Inquiry*, 31(1), 244-255.
Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
Law, J. (1992). Notes on the theory of the actor-network: Ordering, strategy, and heterogeneity. *Systems practice*, *5* (4), 379-393.
Lea, M. & Street, B. (1998) Student writing in higher education: an academic literacies approach. *Studies in Higher Education*, 23 (2), 157-172.
Leander, K. & Lovorn, J. (2006) Literacy networks: following the circulation of texts, bodies and objects in the schooling and online gaming of one youth. *Cognition and Instruction*, 24 (3), 291-340.
Martin, A., & Grudziecki, J. (2006). DigEuLit: concepts and tools for digital literacy development. *Innovation in Teaching And Learning in Information and Computer Sciences*, 5 (4), 249 -267.
Mayes, T. (2006) *L E X – Methodology Report*, Glasgow Caledonian University and Open Learning. http://www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/lex_method_final.pdf
Sharpe, R., Beetham, H., Benfield, G., DeCicco, E. & Lessner, E. (2009) *Learners Experiences of E-learning Synthesis Report: Explaining Learner Differences*. Unpublished project report, Oxford Brookes University. Available online: https://wiki.brookes.ac.uk/display/JISCle2f/Findings.
Sharpe, R. & Beetham, H. (2010) Understanding students' uses of technology for learning. In Sharpe, R, Beetham, H. & De Freitas, S. (eds), *Rethinking learning for a digital age: how learners are shaping their own experiences*, 85-99. London: Routledge.