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Material matters for learning in virtual networks: a case study of a professional learning programme hosted in a Google+ online community

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In this paper, we draw on Actor–Network Theories (ANT) to explore how material components functioned to create gateways and barriers to a virtual learning network in the context of a professional development module in higher education. Students were practitioners engaged in family learning in different professional roles and contexts. The data comprised postings in the Google+ community, email correspondence, meeting notes, feedback submitted at the final workshop and post-module evaluation forms. Our analysis revealed a complex set of interactions, and suggests multiple ways human actors story their encounters with non-human components and the effects these have on the learning experience. The aim of this paper is to contribute to a more holistic understanding of the components and dynamics of social learning networks in the virtual world and consider the implications for the design of online learning for continuous professional development (CPD).

Keywords: professional education and training; learning communities; higher education; Actor–Network Theories

Introduction

Digital technologies and social media, it is argued, offer myriad opportunities for continuing professional development premised on constructivism as pedagogy (Garrison, Cleveland-Innes and Fung 2010; Ravenscroft 2011). A growing body of literature explores the design principles underpinning virtual learning for desired outcomes, and the potential of different technologies to support learning is debated (Anderson 2008; Beetham and Sharpe 2013). These tend to be separate considerations, in which the technical may be 'purified' of the social (Bigum 1998, pp. 588–589); the capacities of computers are essentialised and *assumed* to result in enhanced learning. Nevertheless, terms used to denote the use of new communication technologies for educational purposes, such as 'online learning', 'e-learning' and 'virtual learning' point to the interrelationships between computing and education in which both components are material to the outcomes (Fenwick and Edwards 2010, p. 71).

In this paper, we consider the entanglement of the social and technical in the practices of professional development which exploit digital technologies. We therefore turn towards socio-materialism and in particular Actor–Network Theories (ANT),

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which avoid technological or social determinism (Latour 1993) and conceptualise all things as the effect of networks of relations. The production of outcomes is the result of the *interaction* of the heterogeneous human and non-human components of a network (Law 2009). From the outset, ANT has been applied to the study of processes of technological innovation (for example, Law and Callon 1992; Nespor 2011).

Virtual learning environments and access to these environments are mediated by a range of material components. Whilst some are physical materials (such as the hardware and mobile technologies necessary to gain access to virtual environments), following ANT, we consider corporate policies to be material also; they determine the nature and use of technology within organisations. The conceptualisation of material in socio-materialist theories, such as ANT, extends beyond material as physical artefact or environment to 'relational materiality'; materiality is distributed between social and physical processes (Sørensen 2009). Matter is neither physical *nor* social but emerges in the relationships between the two.

ANT's principle of generalised symmetry (Latour 1987) insists that the agency asserted by non-human components is as significant as that of humans; indeed the boundaries between human and non-human are indistinct. Various components form an assemblage in which the technological and the social are entangled. The concept of the 'cyborg' (Haraway 1991) is a powerful expression of human–technology relations perceived as assemblage. Whilst literature on online learning tends to separate the consideration of learning outcomes into matters of social organisation or technology, ANT sees learning as performed into being in the web of relations between the social, technical and human (Fenwick and Edwards 2013, p. 53).

The educational context

This paper arises from the experience of developing an online learning community in relation to a university continuous professional development (CPD) course aimed at family learning practitioners. The module, Engaging Families in Learning, was developed in partnership by the Universities of Aberdeen and Dundee in the context of current Scottish government priorities, which focus on early intervention. In this context, various practitioners working in communities had their work redirected, or rebranded, as family learning. Family learning is a contested concept (McKenzie 2010), which is applied to diverse practices with children and families. Although the term may be used with distinct assumptions in different settings, the Christie Report (Scottish Government 2011) advocates partnership working across professions to achieve successful outcomes for all children. There are also strong drivers for collaboration across higher education institutions, as well as pressures to employ new pedagogies, especially those which exploit technology to extend learning to distributed constituencies (Barber, Donnelly and Rizvi 2013). The module, then, sat at the nexus of a variety of current educational concerns – new government priorities, new roles for practitioners in partnerships and new professional development pedagogies. In ANT terms, the module is an *effect* of these diverse elements and in its turn *acts* to assemble a variety of components, including, but not only, tutors and students.

The pedagogy of the blended learning module was underpinned by socio-constructivist theories which promote learning as participation over learning as acquisition and understand knowledge as socially negotiated by participants. This form of pedagogy concentrates on facilitating group process and is in direct contrast to pedagogies of online learning, which emphasise individual flexible access to 'expert'

learning materials. Thus, technologies were exploited not to 'deliver' to a distributed group but rather to *connect* dispersed participants. The online dimension of the programme aimed to foster a practitioners' social network and for this reason Google+ was chosen as the platform. Google+ is accessible to all, unlike institutional platforms (e.g. Blackboard) which reflect traditional hierarchical relationships between tutors and students. As well as providing private community spaces with a Facebook-type interface for sharing posts, Google+ integrates a number of collaborative tools, including a shared document drive and a multi-person videocall function (Hangouts). The course participants used these facilities to collaborate in subgroups on three key tasks, which involved sharing experience, researching alternative perspectives and presenting syntheses. Participation in group processes was mandated by a link to the assessment; the course therefore required participants to relate to their peers within the online medium. To use a range of hardware and software they had to negotiate hurdles such as employer Internet policies. Google+ remains a contentious medium that some local authorities have been cautious to adopt perhaps because of risk adversity in relation to employee use and wider ethical concerns relating to data protection.

With a sensibility drawn from ANT, this paper explores the complex interactions (human/human, human/non-human and non-human/non-human) which occurred during this blended learning CPD module, forming complex ecologies of learning and creating gateways and barriers to professional development.

Methods

Data were collected from the platform used to host the network and from concurrent and post-programme evaluation. The data set comprised online postings (textual, audio and visual), email correspondence, meeting notes, anonymous feedback submitted at the final face-to-face workshop and post-module evaluation forms.

This variety of indirect data afforded insights into participants' experiences at different stages of the module. Video material provided a limited view of various physical and social contexts. Whilst interviews may have yielded more detail, they would have introduced a degree of retrospection; interviewees might re-narrativise their experiences from a transformed relationship to technology. However, a limitation of our data is that it was generated in relation to other purposes infused with educational hierarchies and power relations.

Such indirect data can also be problematic in that the boundaries between public and private are blurred, both in the online space and also in the case of institutionally required feedback. Thus, explicit permission was sought from students to use anonymised data for research purposes. As participation in the course was sponsored by employers, it was crucial to ensure that no individual was put at risk of professional reproach. The vignettes presented in this paper fictionalise an amalgam of personal experiences. Such 'fabrication' (Markham 2012, p. 338) is a means to represent pertinent issues without violating individual privacy. All names are fictitious.

In the contrasting vignettes, we seek to represent not merely different experiences but distinct ontologies; to illustrate how material matters are intrinsic to the development of virtual, learning communities based on social network and achievement of learning outcomes.

Initial interactions

The module was conceived with digitally enabled collaboration at its core. In the initial stages of enrolment, some assemblages of components were enablers. The topic – Engaging Families in Learning – connected to government policies (Scottish Government 2012). Combined with discourses of accountability and a professionalising agenda in early education and social care, the module was promoted by Education Scotland, a quasi-government agency. The module also brought together rhetoric about the need for inter-professional development with a demand for focused training for new roles at a time when practitioners in community settings felt threatened by cutbacks. Inspection processes which enquire into workforce development (HMIE 2006) also acted as a driver for managers to identify opportunities for staff development. Austerity in professional contexts makes CPD which does not require staff cover particularly attractive.

Course information was circulated by email to managers, through local partnerships and national networks. Registration of interest was also by email direct to module organisers. This allowed the publicity for the course to circulate widely and places on the course to be filled quickly. There were tensions in this approach, however. The dissemination process is difficult to determine. Student feedback suggests that, commonly, they received information from their line manager, sometimes reduced to the module title and without attachments to information about course expectations. The loss of attachments, as the email was forwarded, meant that in some cases practitioners experienced the manager's 'interest' in their CPD minus the university statement of expectations. The first workshop revealed that some students had mistaken a university credit-bearing course for informal training and experienced the expectations as daunting alongside fulltime work. Two students withdrew at an early stage indicating that their assumptions about the module differed from the reality of their initial engagement. Both cited their lack of familiarity with the online platform coupled with the requirement for student collaboration as the reason for withdrawing. The time required for familiarisation with the technology was stated as the main barrier to engagement.

Marketing materials emphasised the need for participants 'to have access to either work-based or home-based computing/Internet facilities'. Although this basic requirement was met by all, the quality of access and facilities varied across the cohort. In some workplaces, institutional Internet policies prevented students accessing Google+, and basic equipment (e.g. headphones and webcams) was not universally available. In several instances, students' personal hardware was old, and students in rural areas reported slow broadband. The following quotes from three students represent some of the challenges:

> It has been quite a challenge upgrading software on my home PC in order to support the fancy bits and pieces we are being asked to use.
> Work PC is out of the question; libraries ... don't have webcams, so a hangout is not possible there.
> My Broadband speed at home is not quick enough to support the screen-share bit of hangout …. That part of task 2 is going to require a fair bit of problem solving ...

The evidence shows that while participants were sometimes frustrated, some demonstrated ingenuity in overcoming concrete barriers – inadequate equipment – to engage with their peers. Some students successfully argued for improved technical

facilities within their workplace. Others drew upon personal networks to alleviate technical difficulties:

> Thanks to Morag's husband for suggesting an Ethernet cable and to my dad for knowing what that was!

The Google+ 'communities' function allows the creation of a closed group where members can post comments, photos and links. Additional functions are chat, recorded or unrecorded multiple participant videoconferencing (Hangouts) and a drive where documents can be co-edited. The Google+ integrated environment is innovative and emergent. During the module, participants dealt with changing software and these changes drew different types of responses.

> I've enjoyed the challenge though. Having a purpose/deadline is good motivation for me.:-)

Participants were tasked with activities which required them to work co-operatively online in subgroups. Identifying mutual availability with access to appropriate equipment/Internet was sometimes difficult. This difficulty was often represented in dialogue as an inherent issue in online learning. However, our evidence suggests that difficulties in organising synchronous meetings were most likely a consequence of busy lifestyles. This view is borne out by the impossibility of finding a universally acceptable date for the final face-to-face workshop.

Difficulties attributed to the online nature of the module were, then, a messy conglomeration of the technological and the social. Interacting from various settings, infected with micro power relations within macro-political discourses, participants' experiences were inconsistent and perhaps mutually unintelligible. In the next section, we explore the storying of the module in three different ecologies.

The conceptualisation of online courses as ecologies in which people dwell and construct in multiple sites (Fenwick and Edwards 2010, p. 73) provides a framework for our analyses. Three vignettes elucidate the interactions of tutors and students with the material non-human components of the Google+ community. Law (2009, p. 9) refers to 'the material practices that generate the social'. We discuss the material practices described in each vignette, endeavouring to render apparent the multiple modes of ordering and thus the multiple social realities that constituted participation. ANT as a method of analysis helps draw attention to the agency of material non-human components in the assemblage that constituted the Google+ module community and offers an approach for mapping the entanglement of relations between things and ideas and their effects.

Heterogeneous worlds: dwelling in different ontologies

Fiona

> In a large office overlooking the University campus, Fiona works on her desktop computer. As she types to a word document – a work in progress, this paper – notifications of email fade in and out occasionally catching her eye and driving her to minimise the document and look instead at the outlook window, also open. Does she want a REDUCED train ticket? Can she recommend a handyman? She wonders how to unsubscribe to small ads. One email is a Google+ notification. A student query about the current collaborative task. Following the link in the email, she drifts to

Google+ to respond. Moments later her attention is back with the task of writing. But a gentle repetitive ping heralds welcome relief from the solitary struggle. A Hangout request. Mouse click and the text on the screen is replaced by the face of a colleague from another university. They exchange pleasantries: How is the weather? What is the latest austerity measure at work? The removal of office bins! They chuckle. But to work. The paper in progress is shared on the screen and they proceed to discuss, edit, worry and reassure one another. They search in the course community, another window open on each desktop, for a relevant post to copy and paste to substantiate a point. Shuffling noises indicate they have been joined by another colleague. The text on screen is replaced with their own images – three now – as they joke and negotiate who is to do what to finalise their work. Fiona promises to upload the text to the shared drive so they can work on it simultaneously. They agree to hangout in a couple of days.

For the lecturer, the domain in which she experiences the module is professional and ordered by institutional structures within which she feels she can yet exercise considerable autonomy. The components of her world – material and social – are an entanglement which shapes her world in ways which allow her to assume agency. She has her own office; can shut the door for privacy. Her desktop PC is kept up-to-date by technical experts who also provide support, on her request taking over her screen remotely to fix problems she cannot resolve alone. The webcam is permanently on the widescreen, she has administrator rights on her PC, can download Google Chrome in seconds and no firewall prevents access to online sites. There is remote access to email, institutional drives, course learning environments on her personal smart phone, ipad and laptop. Though Blackboard is the institutional virtual learning environment, her choice of Google+ attracts no censure and occasional accolades. The module is a social context in which she works with remote colleagues whom she has known in a variety of roles for many years. They are friends not merely colleagues. There is a bank of social capital in this network which can be leveraged to meet institutional demands for increased student numbers, inter-institutional collaboration, innovative pedagogies, impact, research and publication. For her, then, the course is a fluid, relational space. When she agrees to 'meet' her colleagues, it will be a virtual meeting but there is little to distinguish it from the face-to-face meetings that others on the course hanker after. The hardware and software components are enablers of social contact which in turn enables professional performance. The lecturer stories her encounters with non-human components of the network in ways which emphasise her control, agency and exploitation of potential. They extend her reach and are absorbed into a repertoire of digital practices which morph across the professional and personal, with no fixed boundaries. She describes the course as 'our learning community', emphasising the relational aspects as well as a commitment to equalising power. When problems arise, such as mute microphones in videoconferencing, her responses are framed in the possibilities of the social:

> Hangouts do seem to have changed but not quite sure how. When I figure it out, I'll share. If anyone else does please let us know.
> I wonder if this is a bandwidth issue – has anyone Googled the problem to see if there is advice on the help forums? If 4 are a problem, maybe the groups could decide to have paired dialogues.

The ontology of the lecturer assumes co-construction but the power relations in which as a university lecturer she has more status than her students – practitioners in community work – are not merely social but made material in the different hardware

components and institutional policies. Power relations are messy, however, and within macro-political discourses of higher education and a focus on 'student experience', such practitioners are her customers, and the customer is always right. The tutors seek feedback continuously and emphasise their responsiveness to student desires:

> On the basis of the feedback you gave us about group working ...
> Thanks for giving us an idea of good times. On the basis of this ...

Directed to provide more information and technical support, adapt to different timings, use a different platform, contribute more directive input – to fix discrete components in the network – the tutors suspect there is something about the difficulties which the students cannot tell them.

Mary

After a busy two days delivering workshops, Mary slumps at her shared desk space for the first and only time this week. It's 13.15 on Wednesday afternoon and she is due to finish at 15.00. The phone rings and Mary spends ten minutes confirming bookings for next week's family workshops. Phone down, she switches on the PC and a message flashes up requesting username and password. Eventually, Mary locates the information in her diary. It's hard these days to remember every password. Her manager appears at her desk requesting a copy of a resource pack that Mary designed. Thirty minutes later Mary returns to the PC and opens her inbox. She scans the emails accumulated since the previous Wednesday. A message from her tutor – sent last Thursday – reminds Mary of an impending 'Hangout' at 19.30. She glances at the clock – 14.15– just time to recap on how to do this before heading home. Pulling out a set of instructions, Mary reads carefully, navigating step-by-step: onto the internet, into the Google search engine and into Google+ where her progress is abruptly halted. A red message flashes up, 'this is a restricted site – your attempt to access it has been logged'. She shuts down the PC.

It's now 19.15 and sitting at the kitchen table, Mary switches on the family laptop. A battery warning appears. She sighs and leaves the room, returning a few minutes later with the power cable, having retrieved it from her son's bedroom. Webcam and headphones plugged in, she glances at the clock – 19.20. While the laptop boots-up slowly, she looks for the password and the printed instructions she has brought home from the office. As the screen comes to life she enters the password and scans for the Google Chrome icon, double clicks and proceeds to Google+. Request for gmail password – she types in her son's name and enters her home page. The display isn't quite as she remembers. Scanning the screen she locates the button – join Hangout – the screen flashes up another message – 'installing plug-in'– she waits. The clock on the bottom of her screen registers 19.45. Suddenly a face appears on the screen and then another. A voice through her headphones, 'Hello Mary. Can you see us?' 'Yes. I can see and hear you' says Mary. The voice again – 'Mary – we can see you but there's no sound'. Mary looks despairingly at the screen and goes to find her son.

For Mary, the student, the module presents yet another discrete interest which intrudes into her professional and personal domains. ANT enables us to see Mary as a node in a network but unlike the lecturer, the non-human components of Mary's world often act to disempower.

 Mary considers herself a competent professional and colleagues often defer to her as an expert. Most of Mary's working hours involve contact with learners. She conducts most of her professional activities either face-to-face or via telephone and considers relationship building central to her work. The telephone is for Mary

'mundane technology' (Petersen 2007, p. 80). However, she makes limited use of other technologies and has not accessed IT training as she regards these skills peripheral to her main work and low priority given the limited hours she has available to do her job. Mary is conscious that educational technologies are endorsed in policy (Scottish Government 2014) as offering benefits for communities but does not recognise their agency in increasing her capacity for social contact. Her employer's suggestion that she should register on the module connected, however, with macro-political discourses about the requirement for career-long professional learning:

> My employers had invited me to enrol in order to further my learning, and enhance my career and personal developments. I was willing to undertake the course for these reasons.

The local geographies of her professional activities mean she has few opportunities during working hours to access email. Her employer does not provide staff with laptops or other mobile devices. This means she checks her work email about once a week. She has a university email account and a gmail account but both can only be accessed from home. She finds it onerous opening each and moving in and out of password-mediated discrete virtual spaces. She is unaware that email can be redirected to a single account, and she uses a mobile phone but it is a personal device and not connected to work email.

Restrictive institutional regulations about Internet use[1] have resulted in a blanket block of all social network sites. Despite requests via her manager, access restrictions to Google+ remain, and Mary does not have time or authority to pursue the matter herself. This has been a source of frustration and has prevented Mary communicating with her peers and engaging with module materials during work time.

As a result, Mary has been restricted to engaging with the online community from her household laptop. The laptop was purchased 6 years ago to support her son to complete homework. The operating system is out of date and lacks the functionality of recent models. Mary lives rurally and although linked to broadband, speeds are slow. Her son is a competent user and has a personal Facebook account but he is not familiar with Google+. Mary recognises a place for technology in her son's education and social life but has no desire to enter this world.

For Mary the material non-human components of the module network are encountered as alien actants exercising agency over her capacity to connect and be disconnected from her peers. Engagement in the module network is mediated by unfamiliar objects and concepts over which she feels she has limited control. To exercise agency in the network, she feels she must acquire new knowledge and skill which may have little usefulness beyond studying. Entry into these new territories are regulated (passwords and filters) and by implication fraught with danger. Journeys are time consuming and signposting is sometimes obscure.

> Registration took me an inordinate length of time, firstly to work out the process, then secondly to try to answer some perplexing, or irrelevant, questions.

She is conscious of the potential human and technological threats that lurk on the web and fears making a wrong move. Passwords and filters, as non-human components, exercise agency in the network with both enabling and disabling effects. In Mary's case, these act to block her capacity for spontaneity, a hallmark of her

engagement with learners. Her encounters with the module thus leave her feeling inadequate and disempowered.

Emily

> 10.00 Emily adds her comments to the discussion thread 'Why Google + ? on the module forum'. I find the app easy to navigate and handy to keep me in the loop when I'm on the go. I tend to avoid computers as much as possible and stick to a mobile or tablet'. She checks her bus timetable App, pockets her smart phone and runs to catch the bus.
>
> 10.20 Perusing BBC news as the bus wends its way into town, a headline about literacy of Under5s appears on the screen; she retweets it to colleagues in the pre-school unit and to fellow students.
>
> 10.55 A whistling sound from her phone reminds Emily she has a meeting in 5 minutes. The meeting is with a group of parents who have agreed to share some of their learning experiences for inclusion in her study. Emily picks up her tablet – she plans to use it to record the discussion and upload to the cloud, so that she can work on analysis while on holiday.
>
> 12.30 Emily reflects on the morning's session, typing her thoughts onto her tablet. She muses about the interest the group showed in her research and is pleased that she was able to introduce some of the online resources she has discovered. Some of the group were able to access these with their own devices during the meeting and planned to use them with their children.
>
> 13.30 Emily chats online with a fellow student as they jointly edit a document for their next group presentation. They make some amendments and agree to meet again this evening.
>
> 14.25 Emily fishes out her phone, clips on headphones, switches on the TED talk she downloaded the previous evening and sets off.
>
> 14.55 Standing at the school gate Emily scrolls through Google + notifications on her phone. An invitation to meet online the following day at 3pm flashes up. Emily responds instantly requesting to meet instead at 3.30pm – easier for those with school-age kids. Moments later the arrangement is confirmed as children spill out of school.
>
> 15.15 pm Emily tweets pictures of her children playing in the park to her partner with a reminder to pick up the groceries she ordered online this morning.
>
> 16.30 The children are clustered around Emily's tablet talking to their Grandmother who likes to keep in touch but lives quite far away. Emily gets on with preparing the meal while Granny chats.

Emily's domains of activity, externally observed, are geographically and chronologically fragmented but her smart phone, as she recognises, allows her to 'stay in the loop'. The smart phone permits her to slip seamlessly between family, professional and learning assemblages and, where she chooses, make connections between them. Emily, unlike many of her peers, is connected between the virtual and material worlds in the physical entity of the smart phone and tablet. Seeing these devices through the sensibility of ANT, as actants in a network which manage resources and information crucial to Emily's studies, work and family life, emphasises their agency in Emily's life. The effect these non-human components exert is in Emily's case an enabling one which allows her to participate in personal, work and study activities regardless of her location and for these domains to ebb and flow into each other. Throughout the day, these devices prompt Emily by way of meeting reminders. They alert her to news which in turn she is enabled to comment on and disseminate. They are vehicles for communication, they distract and they entertain. Emily's competency in the material world, that is, her technical knowledge, combined with her access to 'state-of-the-art'

devices means she can navigate and merge the boundaries between physical and virtual domains. Unlike Mary, for Emily the practices that she engages in *are* mundane. Emily shifts apparently seamlessly between the virtual and physical world and the technology acts to blur the distinctions between these.

Discussion

Distinct ontologies

It is the nature of discrete social spaces that one person can never know exactly what another experiences. Inside a bubble (Pariser 2011) made from our own prior gaze and interaction with diverse hardware, software and institutional policies, each of us encounters a virtual world both apparently external and inherently personalised.

There are equity issues within the ecologies of online courses. For example, though there is 'A weakening of the usual structure of everyday life differentiated into different zones of work, study and recreation' (Petersen 2007, p. 86, cited in Fenwick and Edwards 2010, p. 77), this does not hold to the same extent for different participants. For some, the lack of differentiation between work, learning and leisure is a positive reinforcement of each. For others, the demands of personal study invade the domestic life impacting on the individual and families.

There are differences in how participants navigate the current between the different domains - on the extent of control they feel they have in the flood of activities associated with work and personal life. In the network of the online course, the patterns and etiquettes of different domains may clash. For example, flexibility meant that course meetings online often took place outside of normal working hours and both students and tutors participated from home. At these times, domestic furniture associated with family life such as kitchen tables, identities as family members and parents were gathered together with patterns of student tutor communication and work identities. Whilst tutors reported the careful selection of home backdrops which did not contravene professional etiquette nor unduly expose personal circumstances, some students, like Mary operated from within more messy assemblages of the professional and personal, in some instances continuing to manage the demands of family life whilst fixed to a static computer screen. In one instance, a recorded Hangout includes a view of a kitchen-foraging teenager and the associated parent/child banter. Another Hangout was interrupted by a doorbell, requiring the student to leave their computer station; in their absence, other participants become distant voyeurs as domestic relationships played out unselfconsciously. Dress too could vary, as students took part in the comfort of home and distant from the usual expectations of a public professional persona. In some instances, the assemblage offered the student a resource for their learning, where, for example, a family member, like Mary's son, was able to troubleshoot technical issues and facilitate access to the learning network. In contrast, tutors tended to impose the restrictions of professional expectations on the personal domain. Paradoxically, their identities whilst flowing between the professional and personal appeared more constant and less conflicted.

Metaphorical space

While for some participants, like Fiona and Emily, virtual learning is 'mundane technology' (Petersen 2007, p. 80), for others, like Mary, it has the 'exotic character

of … a new frontier' (Sardar 2000 cited in Petersen 2007, p. 80). For those participants for whom the virtual is a new frontier, paradoxically it is the materiality of e-learning which is stressed:

> The course sometimes felt more like an IT challenge than an Engaging Families in learning course.

Rather than the fluidity of everyday practices, in which the material becomes invisible, virtual community is experienced by some as a compartmentalised place. One student described it as 'stretching my boundaries'; 'I'm slowly navigating my way around it'. Some students narrativise their experience in terms of *in and out*, with the material of computer hardware and institutional policies forming the access barriers.

> Having to keep on going back and forth online to check progress and responses is really cutting into my family time and I'm finding it really hard.
> I think Google+ is great once you get in but I would be really struggling if I had been a beginner with ICT.

Students differentiated between meeting in virtual space and in physical space. They hankered after more physical 'face-to-face' contact, with the rationale that they are 'people professionals'. The synchronous hangouts literally allow people at a distance to talk face-to-face. Only the tutors, however, appeared to question the distinction between online meetings and meetings where participants gathered in the university. In some situations, the online face-to-face encounter furnishes the interaction with more not less. For example, the space is mutually constituted; each participant has access to their own resources; more information about their personal or professional circumstances is on view to other participants. In contrast to physical spaces, in which bodies are constrained by space but also by traditions and 'classroom' expectations, participants in virtual spaces are more fully embodied; more of the senses are involved and in some circumstances the physical body is materially connected through the paraphernalia of headphones and microphones.

Whilst it was sometimes perceived by participants and managers that the use of the online space was a device by university staff to diminish their commitment of time and effort, conversely the tutors provided more 'contact' time in the form of online synchronous tutorials than would have been possible for a traditional campus-based module. In virtual space, contact time becomes more dispersed, less quantifiable; indeed, the 'presence' of the tutor is virtually constant. In some respects, the tutor, and the group, is never not there. This shift can be experienced as both a diminishment of responsibility or conversely as an expansion of demand for tutor responsiveness.

Mashups

Comments from students often mash up the technical with the social but in their association, difficulties which are mainly social, such as etiquette with respect to group relations, are translated into problematic characteristics intrinsic to online learning. Even issues which are not specific to e-learning, such as problems of

coordinating contact time or fitting study within patterns of work, are translated into technical issues:

> Perhaps the most stressful part of online working with Google+ is finding a time when everyone in the group is available.
> I wonder if setting some kind of initial deadline for groups to confirm they have arrangements in place to complete the task would be a good idea – so that way if people just don't engage you aren't waiting and wondering if they are participating or not.

There is a danger that facilitators will try to respond to the expressed technical 'needs' without a full appreciation of the assemblages of materials which constitute the distinct ecologies within which each student narrates their experience. Feedback can be contradictory:

> I've found using Google+ quite easy and the instructions you've given us have been very straightforward and informative (but I'm lucky to have a modern computer which makes it easy)
> I'm not really sure what to say here I have found trying to collaborate on Google+ quite tricky.

Where participants encounter the same technical issues – such as a change to the software – they respond differently to it within a distinct paradigm which tends to emphasise *either* the social or the physical. This seems not to be simply a matter of experts and novices (concepts which concentrate on the human as the sole actor) but rather the association of various components some of which are material. The risk therefore is that the narration of problems and/or attempts to address problems, arise from mutually inconsistent paradigms. Students often ask for more technical support in the university, perhaps in the belief that such knowledge will translate unproblematically to their own setting.

> Skills and equipment needed prior to starting – Next time . . . offer a Google+ tutorial, in person, before the course starts

Student feedback

Law (2009) argues that ANT offers 'a sensibility to the messy practices of relationality and materiality of the world' (p. 142) suggesting it is insufficient to tinker with the technical or to up skill individuals. Perhaps, instead the enterprise must be to enable the unpacking of the assemblages of the black box of e-learning and its material and social components.

Conclusions

ANT elucidates the notion that actors – human and non-human – perform together to create an effect (Law and Singleton 2000). The effect we found was the production of what Law (1994) refers to as multiple versions or modes of ordering in which the macro interacts with the micro to produce ecologies suffused with power. These modes of ordering offer different realities.

Within the macro-political discourse of education as a service to consumers, providers are assumed to 'meet the needs' of CPD participants and sponsors. Increasingly, the 'need' for low-cost distance learning to address constantly shifting

professional priorities implies technology-enabled learning. The technologies, however, are assembled in networks combining the social and technological and ordered by micro- and macro-political discourses. An online course exists in varied ecologies being constructed and narrativised in different sites. Where this narrative emphasises the technological components and ignores the social, course providers can be tempted to try to 'fix' individual components without an appreciation of the distinct ecology. For example, in this case, it was tempting to try another platform in response to student's feedback about Google+. Alternatively, course evaluation can concentrate on the human dimension – students' digital capabilities, confidence and knowledge. ANT provides a different way of understanding virtual learning: 'We need to understand the learner as cyborg: a hybrid of material and knowledge' (Fox 2000, p. 864).

Rendering mundane the material components of the network seems to require explicit attention to the meta-narratives that frame the way learners story their engagement. This can perhaps be achieved through strategies which develop more understanding about the nature of learning in virtual spaces and the mediating role of the ephemera of domestic and professional life. A course design which at a preliminary stage raises awareness in students about themselves as actors in the network and the roles they perform in relation to other actors, human and non-human, will perhaps allow more productive engagement with the curriculum at a later stage.

Note

1. A survey carried out by TES in 2012 indicated widespread restrictive Internet filtering policies were operated by most of the 32 Scottish Local Authorities.

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