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Digital literacy: digital maturity or digital bravery?

Institutional strategies for supporting learners in a digital age

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Abstract

This study examined the policies and practices in nine UK institutions of further or higher education that had made a commitment to supporting students to develop their capabilities to learn in the digital age. Data were collected over a six-month period through multiple interactions with case study sites. Analysis of these data captures institutional practices and the results are mapped onto a developmental framework for effective learning in a digital age.

Recommendations are made to institutions considering how best to support their learners, including the need to: specify digital literacies in learning and teaching strategies; prepare students for their experience of learning with technology; reconfigure campus spaces to enhance connectivity and support a range of social learning activities; and create a culture of engaging with students to inform decision-making. These institutional practices aim to support learners to make use of their digital skills and practices. The ultimate aim is to graduate students who can creatively appropriate technology to suit their own learning environment and needs.

Key words: digital literacy, learner development, case study, access, skills, student engagement

Introduction

Background

This paper focuses on the impact of learner experience research on educational institutions, specifically how UK further and higher education institutions are creating and enabling opportunities that promote the development of effective learning in a digital age. A considerable body of research has elicited and captured learners' experiences of learning with technology (e.g. Jefferies and Hyde 2009; Seale *et al.*, 2010; Edmunds *et al.* 2010; Masterman and Shuyska 2011). Such studies provide vivid insights into the complex lives of today's learners and confirm the value of listening to learner voices and engaging learners in decisions that impact on their experience. Of particular interest here are recommendations which emphasise the need to prepare students for learning in a digital age, including the development of their digital literacies (e.g. Beetham *et al.* 2009) and helping them make good choices about how they use technology (Sharpe *et al.* 2009).

Effective learning with technology

There is no doubt that learners are experienced in using a wide range of information and communication technology (ICT) as they enter post-compulsory education, from word-processing applications and email (Whittle *et al.* 2010) to social networking sites (JISC 2008). However, empirical studies show that this access to and familiarity with technology does not explain patterns of use: students' use of technology is not defined by what they have access to (Lebens *et al.* 2009; Hargittai 2010). Evidence is also emerging that, even with widespread access to technology, learners display difficulties when using it in academic contexts: for example, to search and retrieve online information sources (JISC/UCL 2008), to manage competing online activities (Winter *et al.* 2010) and to find time in the curriculum to develop competence in using technology (Buckley *et al.* 2010). Much has been achieved in supporting students' development of learning skills, such as the move to integrate skills development programmes in the curriculum (Deardon *et al.* 2005), and it will be important to learn from this work as we continue to support effective learning in digital contexts.

What we are finding is a complex picture where learners are immersed in a technology-rich environment but make use of the technology available to them in a range of different ways. In summarising a four-year programme of learner experience research (JISC Learner Experiences of eLearning programme), which involved ten projects and around 200 learners, Sharpe captures this range and complexity in her conclusion:

> *While some learners feel disadvantaged by a lack of functional access to technology or the skills to use it properly, others are making deliberate choices to adopt sophisticated technology mediated learning strategies and ultimately, finding and using a range of tools in personalized, creative ways to support their study.*
>
> (Sharpe *et al.* 2009: 8)

It is not the purpose of this paper to attempt to explain learner differences, although we note that they appear to be largely influenced by context – whether that means background factors such as socio-economic status (Hargittai 2010) or more immediate context like individual learning needs (Seale *et al.* 2010) – and, importantly for educators, by pedagogy (Ferreday and Hodgson 2008) and a developing maturity over time (Hughes 2006). If some students are able to make good use of technology in some contexts, while others struggle, what is the role of the institution in enabling students' effective use of technology?

One product of the JISC Learner Experiences of eLearning programme was a developmental framework, which explains that learners need functional access, skills, practices and attributes to learn effectively with technology (Sharpe and Beetham 2010). As shown in figure 1, these four elements of learner development are arranged in a hierarchy such that the attributes of effective learners are built on learners' technology-based skills and practices. This notion of a hierarchy is also suggested by Wei *et al.* (2010), whose empirically based model shows how digital *access* affects digital *capability* and, subsequently, digital *outcome* among students in Singapore.

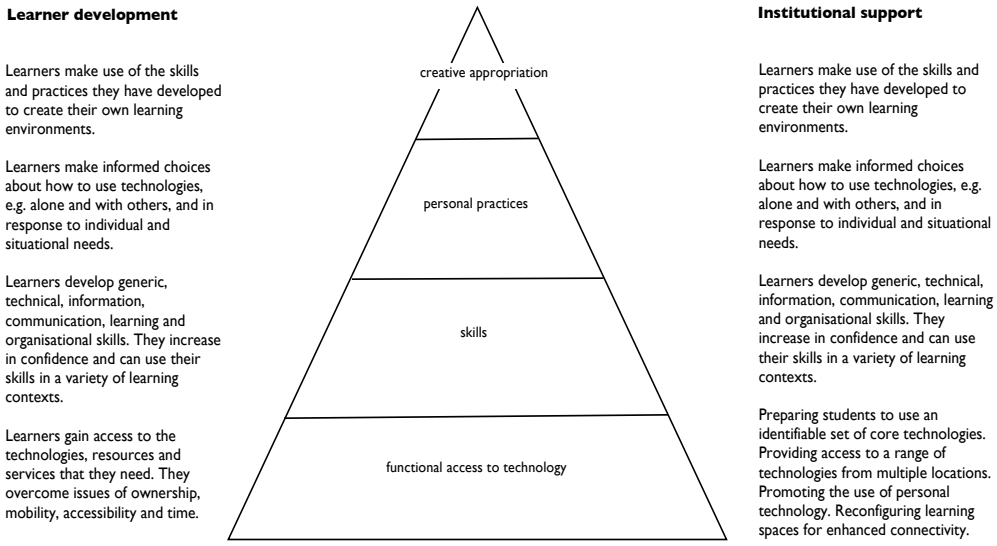

Figure 1: A developmental model of learning effectively with technology (adapted from Sharpe and Beetham 2010)

One way in which Sharpe and Beetham's model might be used is to explain and illustrate what effective learning with technology looks like. Another way is to look at how learners develop through the levels of the model. A third use of the model might be to examine educational and institutional practices that support learner development towards effective learning. It is this third use which is elaborated in this paper.

The role of the institution

The role of the institution is an important contextual factor in influencing how learners develop the digital literacies and other technology-assisted practices to be effective in a digital age. Learners have clearly articulated that they expect institutions to provide robust, reliable and accessible technology to enable them

to use technologies wisely (JISC 2008). The question then arises of how institutions are creating opportunities for learners to develop their capacity to learn effectively in a digital age. This paper presents the features of institutional policies and practices that support learner development, mapped against Sharpe and Beetham's developmental framework, to provide recommendations for others wanting to understand and explore the value of such practices.

Method

Case study sites

The Supporting Learning in a Digital Age (SLiDA) project ran for eight months (March to October 2010) with the aim of finding out how institutions are creating and enabling opportunities that promote the development of effective learning in a digital age. The project used institutional case studies to engage staff with the issues (see SLiDA 2010 for full details of case studies). The case studies illustrate the different ways in which further and higher education institutions are preparing students for learning in a digital age. They explain what has happened, what the student experience has been of these initiatives and what has been achieved at the institution concerned.

The first challenge was to decide on the case study sites. An open call was distributed to UK colleges of further and higher education to which there were around 30 expressions of interest. In deciding which of the sites to work with, we developed certain selection criteria. We were looking for institutions with institution-wide practices in place which demonstrated that they:

- were taking seriously their responsibility to develop learners' academic, digital and learning literacies
- were interested in examining the evidence they had available for making decisions about learner development, and
- would be willing to share their innovations (both progress and challenges) with the sector.

Ten sites were selected: seven higher education, two further education and one specialist college. Of these, nine continued to the end of the project and these case studies have been published (SLiDA 2010).

Data collection

To ensure that case study representatives focused on questions relevant to the project, a cycle of key interactions was planned to take place over a period of six months. Around these key events, the project team maintained an ongoing conversation with each of the case study sites. The key events were:

- a welcome pack, including formal acceptance as a case study site and clarification of ethical and legal implications
- phone calls to build a background picture of work at the institution
- an online workshop to share project aims and consider evaluation tools and forms of evidence
- a site visit to collect and record experiences from others involved in the institutional developments
- document sharing to produce a case study outlining what had been done at the institution, how it was being evaluated, findings and recommendations.

Ethical approval was obtained from the lead institution's University Research Ethics Committee. No incentives were offered for participation. Consent was obtained from each individual interviewed and for each document shared.

In total, 43 staff and seven students were interviewed from nine institutions (see table 1). The staff interviewed were chosen for their knowledge of and/or involvement with their institution's support of students' use of technology for learning; they included educational developers, subject librarians, senior managers and teaching staff. Students interviewed had often been in positions where they had researched and/or represented student opinions. Interviews were conducted individually and/or in small groups and were audio- and video-recorded and transcribed.

The analysis took place in two phases. First, the project team worked collaboratively with representatives from each institution to agree a case study that accurately represented their work. These case studies documented the actions taken by institutions to support the development of learners in a digital age and are summarised in table 1 (see SLiDA 2010 for full details). This paper reports on the second phase of the analysis, where Sharpe and Beetham's (2010) developmental framework was used to analyse the steps taken by institutions to develop the digital capabilities of their learners.

ID	Summary of institutional case study
A	Abingdon and Witney College has a digital and learning literacy induction session for all full-time students. They believe this will increase learners' understanding of how to use technology in a further education environment and increase staff engagement with the concept of digital literacy.
B	Birkenhead Sixth Form College has pioneered the use of learner-owned devices to support technology-enhanced learning. The college has extended its computing infrastructure to provide increased support for teaching using learner-owned devices. It has ubiquitous wireless access across the campus, enabling students to connect to the network using their own devices, and a virtual desktop system, based on thin client technology, which enables students to access the network remotely.
C	The University of Edinburgh has redesigned learning spaces in response to learners' needs. The Science and Engineering campus has a new learning and teaching cluster which offers a variety of learning and teaching settings designed to promote collaborative work, together with a large informal study and social area. The main library has undergone major redevelopment to support a range of learning and research activities.
D	The University of Glamorgan has created a culture of engaging with students in order to better understand and manage students' expectations of the use of technology at university. Two initiatives have been influential in understanding and responding to student expectations: the Student Expectations research project and its subsequent implementation task groups, and the creation of the role of Student Voice Representative.
E	London Metropolitan University has continued a strategic emphasis on blended learning in its university strategy and an accompanying learning and teaching policy. These show how an institution that has some history of blended learning can begin to embrace the notion of contemporary digital literacies in the curriculum.

F	Oxford Brookes University has used student experience research to drive digital literacy to the top of the policy agenda. The Strategy for Enhancing the Student Experience requires all undergraduate programmes to develop five graduate attributes, one of which is digital and information literacy. To underpin this, a conceptual model is being used to help codify digital literacies at the programme level, where programme teams are auditing current practice, and to identify gaps and aspirations.
G	The University of Salford is developing curricula that encompass the development of digital literacies in the context of their distinctive curricula in media, creative arts and business. When combined with the implementation of the institutional Information Literacy Strategy and the curricula being developed for delivery through Salford's new Media City, the university has the potential to develop and evaluate how to embed digital literacies into the curriculum across the university.
H	CoLab is a student-led enterprise at the University of Surrey that provides a range of services for students, staff, the university, the local community and external institutions. CoLab includes a dedicated team of students who, as part of their placement year, listen to students in order to develop strategies to respond to student technology needs. They also engage in staff development, provide technology services for hosting in-house and external conferences, and respond to emerging technology demands in the university.
I	The University of Wolverhampton has identified digital literacy as one of its three key graduate attributes. These provide an overarching vision about what the university offers alongside professional and subject expertise. Digital literacy sees graduates as confident users of advanced technologies who will lead others, challenging convention by exploiting the rich sources of connectivity that digital working allows. The undergraduate curriculum was redesigned recently with graduate attributes being a core element. Development of digital literacy in courses is through: (i) a student activity-focused blended learning curriculum, (ii) a focus on information literacy capability, and (iii) uses of cutting-edge, work-related technologies.

Table 1: Summary of case studies

Results

Sharpe and Beethams' (2010) developmental framework was used to identify the types of institutional policies and practices being put in place to support the development of learners' effective use of technology. This allowed us to highlight the extent of existing practice and any gaps in institutional provision. Examples of provision at each of the four stages of the framework are shown in table 2. This table also shows the enablers and barriers at each stage, as expressed by learners in previous work (Sharpe *et al.* 2009), allowing us to look for matches between what learners say they need to progress and institutional provision.

Level	What learners say are enablers and barriers at this stage of development (from Sharpe *et al.* 2009)	Examples from case studies
Functional access Learners have access to relevant technologies, resources and services. Having functional access might include issues of ownership, mobility, accessibility and time.	Resources that can be accessed anywhere via the institutional virtual learning environment, with single sign-on and access prior to arrival. Providing resources in multiple formats, including audio-visual, and with access to applications that support audio and other media. Study materials in electronic format that are downloadable, including e-books, and 'Desktop Anywhere' to allow work off campus. Provision of spaces to plug in and network personal laptop (or available campus-loan laptops) and technical support for own laptops.	A universal induction in digital learning technologies. Induction topics include email, connecting to the intranet, plagiarism, the virtual learning environment, remote access and customising your computers. The induction mixes multimedia with in-class activities and the online resources are available anytime, anywhere (site A). The college offers ubiquitous wireless access across the campus, enabling students to connect to the network using their own devices. The college maintains a small pool of these devices for those students who do not own one (site B). Extensive redesign of learning spaces in response to learners' needs. Refurbishment of faculty and library spaces, which offer a variety of learning and teaching settings designed to promote collaborative work together with a large informal study and social areas (site C).
Skills Learners develop generic technical, information, communication and learning skills.	Support from family and friends or from formal teaching (such as the European Computer Driving Licence), to develop basic IT skills e.g. word processing, touch typing, anti-virus updates, backups, installing software updates.	The university has initiated a project to develop and implement an institution-wide information literacy strategy, using SCONUL's Seven Pillars of Information Literacy (1999) as a framework for development. Many courses broaden this

	Guidance and training on how to access to key academic resources such as online journals, which is not confined to induction. Clear explanations about new technologies learners are expected to use, both in terms of how to use it and why it is of value. With heavy workloads, student need to be given time to develop skills. Staff also need the skills to use the technology appropriately, reducing inconsistency of the student experience created by staff.	view of information literacy to encompass personal, organisation and societal skills in using technology, contextualised in the disciplines (site G). A set of digital literacies has been identified; namely, that graduates should be self-regulating citizens in a globally connected society, able to handle multiple, diverse information sources and media, proficiently mediating their interactions with social and professional groups, using an ever-changing and expanding range of technologies and able confidently to use digital technologies to reflect on, record and manage their lifelong learning (site F). The university has identified digital literacy as one of its three key graduate attributes. These provide an overarching vision about what the university offers alongside professional and subject expertise. Digital literacy sees graduates as confident users of advanced technologies who will lead others, challenging convention by exploiting the rich sources of connectivity that digital working allows (site I).
Personal practices Learners make informed choices about how to use technologies, alone and with others. They develop personal, flexible strategies in response to situational needs.	Tutors allowing and even encouraging learners to develop their personal practices e.g. allowing teaching sessions to be recorded, providing materials available for downloading to personal technology. Provide flexibility and choice, acknowledging the many differences	Supporting students to use personal technology in productive ways. Making the use of personal devices, such as personal laptops, smartphones, camcorders and audio devices, a central tenet of technology use across the curriculum. Staff supported to adopt innovative use of mobiles and flipcams in class (site B).

	among learners. Confidence to explore new tools and resources. Recommendations from peers about technologies.	Consultation exercises with students, including learner voice conferences and impromptu focus groups with students by the college principal, to involve students in decisions about support for flexible study e.g. reconfiguring college workspaces to enable staff–student collaboration and social learning and improve off-site access to learning activities and resources (Site A). A project recruited student e-champions to use technology to help support other students' learning and to act as a link between students and staff (Site I).
Creative appropriation Learners' conceptions of the role of technology allow them to make use of the skills and practices they have developed to create their own learning environments.	Learners' expectations of innovative uses of technology are limited by a lack of prior experience and knowledge of what university can offer. Learners adopt a cautious, conservative, low-risk approach to study when the risks are high. Being practised in making decisions about which technology to use for which purpose Familiarity with functionality of personal technology, to allow for creative use	Creating a culture of engaging with students has informed changes in upgrading software in labs, online submission of assessments and wifi across campus (site D). A student enterprise to prepare learners for a digital age where students develop their own digital literacies through team working on technology projects for the university, local community and external institutions (site H).

Table 2: Examples from case studies of support for students at each of the levels

Level 1: Functional access to technology

The first level of the framework is the requirement for learners to be able to access technology, resources and services. At this stage, learners benefit from electronic resources, provided in a variety of formats, which can be accessed on or off campus using institutionally provided and personally owned technologies.

Virtually all the institutions (sites A, B, E, F, G, I) were concerned to adequately prepare their students to use an identifiable set of core technologies. The clearest expression of this is a focus on induction, ensuring that all beginning students are aware of the digital learning tools they will need and know how to use them. Site A is the purest example of this, having invested considerable time and resources in a universal e-learning induction programme. The need for students to have flexible access to the induction materials was recognised and learners were offered an online multimedia version in addition to in-class activities. This helps them prepare for learning with technology even if they enter the university or college outside the usual enrolment periods.

It is clear that a high proportion of students own their own laptops and routinely carry with them a range of digital devices including, increasingly, web-capable mobile phones. As well as having a personal attachment to them, learners require less support with using their own devices than with unfamiliar institutional ones. Each institution was accepting and supportive of students using their own devices on campus and provided easy, secure network access.

Preparing learners for the digital age requires spaces and associated pedagogical approaches that enhance learner engagement and involvement in the learning process. It is increasingly clear that the traditional configuration of classrooms and learning spaces does not adequately support the effective use of modern digital technologies for learning. As is typical across the sector, the case study institutions were, wherever possible, reconfiguring campus spaces to enhance network connectivity and to support more social learning activities. What is important about these developments is that they permit a range of technologies to be used, from wireless laptops to whiteboards, pencils and paper. A range of learning preferences and pedagogies is supported, from individual to collaborative, formal to informal.

The case studies reinforced the definition of this level as 'functional' access rather than simply ownership or availability of technology. For example, in explaining their rationale for their induction programme, staff at site A observed that students had not always been aware that they had an institutional email address or had been unable to use their personal technology on campus. As well as anticipating issues that might limit learners' functional access, some institutions were also engaging in investigations and conversations with learners to improve their understanding of their needs (sites D, F, I). For example, at site D, focus groups with students had uncovered a specific problem for international students who were unable to install broadband in their homes because they had no UK credit record and were resident for short periods of time.

Level 2: Skills

At this level, learners develop generic technical, information, communication and learning skills. The development of their skills is supported by formal education and by training opportunities and informal, social learning. Learners find it useful to have consistent, clear explanations from staff about what technology to use and why, and to have time to develop the skills necessary to use technology in their study.

Several of the case study institutions had a strategic focus on skills development (sites A, F, G and I) and confirmed that this was still needed, despite the seemingly pervasive use of technology in society today. For example:

> *It's amazing how many of the students actually say "I didn't know how to use simple Office programs" or "I didn't know how to access online journals".*
>
> (Staff interview 1, site G)

In defining what skills are needed, institutions are drawing on the literature on information and digital literacies, using and adapting existing models to codify what they expect from students. As shown in table 2, these are sometimes expressed as graduate-level attributes in institutional strategy documents (sites F, G and I). However, rather than encouraging the adoption of a set of generic skills, we found that institutions emphasised the importance of course design in articulating discipline-specific digital literacies at module or course level. In one institution, staff clearly articulated how they had decided against an alternative model of a compulsory information literacy module taken by all students (site G). They explained that embedding skills development in the curriculum, such as scheduling sessions close to assignment deadlines, was meeting the needs of learners in a timely way. Another important feature was the notion of digital literacies contextualised in the academic discipline, as expressed below:

> *To be part of a student is to be part of a scholarly community … that's why it's important that it's embedded in the curriculum because scholarship isn't freestanding, it's got a context.*
>
> (Staff interview 1, site G)

Level 3: 'Personal' practices

At this level, learners become practised at using technology and develop personal, flexible strategies in response to their individual and situational needs. To help learners to make good choices about which tools and strategies to use in which situations, they benefit from staff support, recommendations from peers and building confidence to experiment with technology.

The interviews with students provided examples of the choices they have to make, particularly around where to study. Some learners talked about deciding whether to work at home or on campus, explaining that when at home using their personal computers they were prone to distractions whereas coming to campus enabled them to focus on study. One graduate demonstrated a quite sophisticated understanding of the different learning environments provided. He used social spaces in the early stages of assignment preparation "because it's more relaxed and comfortable to work there" and booked individual study spaces "if you wanted to just be on your own and get your work done" (student interview 2, site I).

Of interest here are the actions institutions are taking to help learners think consciously about such choices. These largely focus on choice about how to use new physical learning spaces to interact with staff (site A) and work collaboratively with other students (site C). Another example is providing support for using learner-owned devices, for example:

> *A lot of students didn't realise they had an audio recorder in their phone … [now] they actually make their own notes, upload them and create podcasts as a class.*
>
> (Staff interview 1, site B)

To support the development of practices through peer learning, one case study recruited student 'e-champions' to use technology to support other students' learning and to act as a link between students and staff. This had resulted in students creating course content in partnership with academics, for example by blogging on their understanding of lectures and writing formative assessment tasks which were then shared with and commented on by students and tutors (site I).

In order to distinguish this level from 'skills', we noted the emphasis on *personal* practices and suggest such a renaming of the level.

Level 4: Creative appropriation

At the pinnacle of the development framework is the notion of creative appropriation, where access, skills and practices combine to become unconscious through practice. At this level, learners demonstrate advanced, sophisticated uses of technology, often combining personal and institutional technology. Student behaviours are driven by need and often happen outside the control, and in many cases beyond the knowledge, of tutors. Learners at this level need to be supported to develop their conceptions of the role of technology and the time and confidence to adopt exploratory, risk-taking behaviours.

There were few examples of creative appropriation of technology by learners in the case studies. However, where they occur, they are striking and staff express their surprise at discovering what learners are doing, for example:

> *We got them to do some digital artefact, and they were using other people's to actually revise from, which we never realised.*
>
> (Staff interview 1, site G)

Although one of the defining features of creative appropriation is that it occurs outside the control of tutors, institutions have a role to play in creating environments where learners can experiment and devise their own solutions. One such environment is the student-led enterprise at site H, which provides a range of services for students, staff, the university, the local community and external institutions. It includes a dedicated team of students who, as part of their placement year, develop strategies to respond to student technology needs. In such a context, students develop their own digital literacies through working in teams on projects, such as delivering staff development workshops, designing technology-enhanced tools, providing technology services for hosting in-house and external conferences, and responding to emerging technology demands in the university.

It has been suggested that creative appropriation has been limited by students' conservative expectations of pedagogy and lack of understanding of what technology can offer (table 2). We saw evidence of this here, with time perceived as an important barrier. For example, a graduate student reflecting on their use of e-portfolio during their undergraduate degree stated:

> *I just didn't have the time when I was a student, I was close-minded, just didn't see the point … [now] I've been using PebblePad through my iPhone to update my blog and other stuff, but that's been a very, very recent change for me.*
>
> (Student interview 2, site I)

Seven of the case study sites had set out to create opportunities to engage with students in order to better understand and manage their expectations of the use of technology (sites A, B, C, D, F, H, I). For example, a research project at site D involved staff/student task groups conducting student focus groups to investigate specific areas. Among other things, this immediately led to recommendations for achieving more consistency in staff use of the virtual learning environment (VLE), student training in use of the VLE, and online access to Skype and social networks on arrival. Continued student input has led to upgrading software in labs and the development of an online assessment submission system.

Discussion

This paper set out to identify the institutional support being provided to develop learners in a digital age, and to map their provision against the levels of Sharpe and Beetham's developmental framework. Looking at each of the levels of the framework in turn, we found a good deal of support being offered to students at the first two levels (functional access and skills) but less at the second two levels (practices and creative appropriation). Here we use the results to formulate amendments to the framework and recommendations for institutional practice.

We found examples of institutions supporting students' ability to access a range of technologies from multiple locations, for example induction activities for using institutional technology, promoting the use of personal technology (including stocks kept for students without their own), ubiquitous wireless networking and reconfiguring physical learning spaces for enhanced connectivity. We noted a growing recognition that access is not only to do with ownership and availability but also the ability to use the technology. There were good examples of institutions seeking learner perspectives in order to ensure that *functional* access was sufficient. The case studies reinforced the definition of this level as 'functional' access.

At the level of skills, we again found good provision, with a number of strategically important initiatives led by senior management to ensure all students had opportunities to develop the skills to use the technology they had access to. However, rather than generic ICT skills development, we found an emphasis on the development of information and digital *literacies*, drawing on existing conceptualisations of these literacies and contextualised in disciplines. We noted a strategic emphasis on programme-level initiatives, embedded in different ways, from timetable scheduling through to programme teams auditing their current practice and course redesign. Such initiatives result in an articulation of discipline-specific digital literacies. It is envisaged that, over the coming years, this could result in explicit descriptions of when, where and how students' digital and other learning literacies are being developed.

At the level of practices, we found evidence of learners making choices about where to study and the role of technology in those choices, confirming the role of this level in the framework. In order to distinguish this level from skills, we noted the emphasis on *personal* practices and suggest a renaming of this level. Institutional support at the personal practices level took the form of helping students to understand how they could use their personal technology to support their learning and supporting the role of peer learning. There are two important points to note here: first, the role of institutions in providing structures for support (for example, the 'e-champions' role); second, the role of staff in being open to students using technology in what might be unfamiliar ways. Staff talked about the reticence of some of their colleagues to support learners to use some technologies, particularly learner-owned devices, in their study.

In previous research, such personal practices have been most visible in disabled and international learners with specific needs, which Seale and colleagues have termed 'digital agility' (Seale and Bishop 2010; Masterman and Shuyska 2011; Seale *et al.* 2010). While we found recognition of the needs of these groups of learners to access technology and skills development, we didn't find any examples of support for developing their practices. We suggest that institutional support for the development of personal practices is likely to be most effective where it is provided in response to student needs. This means that institutions need to regularly investigate and uncover the experiences of their students.

The final level of creative appropriation has always been the most difficult to define but is perhaps the most interesting in terms of understanding digital literacy. Here learners' conceptions of the possibilities of technology-mediated study become increasingly important in influencing their behaviours. What support might institutions adopt for supporting students to reach this level? Perhaps the challenge is for institutions, via their

curricula, to encourage the exploratory, experimental behaviours with technology of students, and to reward innovative use. Institutional support here might also be about encouraging dialogue with students about the choices that have been made about technology use in their courses, in order to help them devise their own uses of technology.

Finally, in each case, we heard the same message expressed in various ways: institutions wanting to better support students to use digital technologies are feeling their way in new terrain. All the institutions involved sought active input from their students in policymaking and implementation. Creating a culture of engaging with students is a theme running through all case studies, demonstrated by, for example, student experience research projects, reviewing student representation systems, providing student work placements or appointing student champions.

Conclusions

This paper has shown one way in which a model for understanding digital literacy development can be used to examine institutional practices. In doing so, we have suggested some minor clarifications to Sharpe and Beetham's (2010) development framework. We consider that such theoretical developments are important, both to the field as a whole and to institutions looking for practical ideas. We therefore offer the following observations to institutions considering how best to support their learners to study and learn successfully in a digital age:

- First, in order to promote *functional access*, students need preparation for their experience of learning with technology. Induction is an important stage and students need flexible access to induction resources and activities.
- To promote subsequent *skills development*, digital literacies should be explicitly specified in learning and teaching strategies, contextualised for the discipline, embedded in the curriculum and mapped across all programmes. Those institutions that have made the most progress with this have included digital literacies in their core graduate attributes.
- Developing core skills into effective *personal practices* requires supporting students to make good choices about where and how to study. Institutions were able to support this stage by reconfiguring campus spaces to enhance network connectivity and supporting a range of social learning activities.
- Creating conditions that encourage students with effective personal practices to *creatively appropriate* their technology use might involve designing curricula that encourage exploratory, experimental uses of technology.
- Learners are clear that most of their technology use for learning is defined by the courses and tutors. The powerful influence of context means that teachers and their institutions need to take the lead in developing their learners.

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