Towards a Fusion of Formal and Informal Learning Environments: the Impact of the Read/Write Web

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Abstract: The read/write web, or Web 2.0, offers ways for users to personalise their online existence, and to develop their own critical identities though their control of a range of tools. Exerting control enables those users to forge new contexts, profiles and content through which to represent themselves, based upon the user-centred, participative, social networking affordances of specific technologies. In turn these technologies enable learners to integrate their own contexts, profiles and content, in order to develop informal associations or communities of inquiry. Within educational contexts these tools enable spaces for learners to extend their own formal learning into more informal places though the fusion of web-based tools into a task-oriented personal learning environment. Where students are empowered to make decisions about the tools that support their personal approaches to learning, they are able develop further control over their learning experiences and move towards their own subject-based mastery. Critically, they are able to define with whom to share their personal approaches, and how they can best connect the informal learning that occurs across their life to their formal, academic work. The personal definition or fusion of tools and tasks is afforded through individual control over the learning environment. The flowering of personal learning aims, mediated by technologies and rules of engagement, occurs within task-specific loops where learners can interpret and process epistemological signals. In turn, where those loops are located within broader, personalised environments students can make contextual sense of their learning and extend their own educational opportunities. Moreover, they can extend their own academic decision-making through application in other contexts, and as a result manage their own academic uncertainties. This is evidenced through a thematic study of the voices of both learners and tutors, which highlights how the read/write web can be used proactively by educators, using specific tasks to enable learners to fuse their informal and formal learning spaces, and thereby enhance their decision-making confidence. The structuring of learning spaces that enable users and social networks to manage their educational processes is enhanced by read/write web approaches and tools, and in this paper is defined through a Fused Learner Integration model.

Keywords: learner; personal learning environment; formal learning; informal learning; read/write web; Web 2.0; thematic analysis

1. Introduction

The impact of the read/write web, or Web 2.0 as it is commonly known, on learner engagement within higher education is a central focus of current e-learning research (Ebner, Holzinger and Maurer, 2007; Conole et al., 2006; Mason and Rennie, 2007; Mayes, 2006). In particular, pedagogues have been re-thinking the implications of the read/write web in extending environments for situated, informal education, and for addressing the blurring of the boundaries between personal, social spaces and formal learning contexts (JISC, 2007).

In part, this blurring of spaces has been catalysed by the structures and affordances of user-centred technologies and their ability to be mashed (Webmashup.com, 2007) or modded (El-Nasr & Smith, 2006). The open nature and availability of key source code, wedded to the participative models that exist for re-working both content and presentation, enable dynamic, hybridised and derivative knowledge development. The ability for users to work with a variety of networks to mash-up, modify or recreate both content and applications extends their self-presentation and knowledge (Franklin and van Harmelen, 2007).

There is scope for extending this analysis to develop fused models of learning. Here users engage with both the signals and the connections that are made by-way-of real-time and synchronous engagements in the physical and virtual worlds (Ibrahim, 2008). This is connected to nascent work on both mixed reality (Mixed Reality Lab, 2008; MXR, 2008), where real-world and computer-generated information are merged to present new visualisations or simulations, *and* augmented reality (Hainich, 2006), where live visual streams are enhanced by computer-generated information. Critically, it is the fusion of information sources in the real and virtual worlds, primarily with or for users in similar contexts that affords new connections between formal and informal settings. Moreover, where fused,

networked spaces are co-owned and developed, they enable users to engage varied perspectives and approaches (Barnett and Coate, 2007).

Empowering learners to design and deploy fused, formal and informal educational spaces not only extends the power of situated, individual, educational outcomes, but can also positively extend their personal learning experiences. This is impacted by: the contextual control available to users to manage uncertainty; the rules that underpin access and participation; the feedback and signals received from associations within those contexts; and the development of personal literacies. This thesis is framed by the outcomes of a thematic study of the voices of both learners and tutors, in order to argue that the read/write web should be used proactively by educators to enable learners to fuse their situated, informal and formal educational spaces, and thereby enhance the production of educational outputs.

2. Users, networks and the read/write web

The affordances of web-based applications are such that tools can be embedded within the curriculum at low cost in order to connect people and information. These tools are often known as Web 2.0 applications (O'Reilly, 2005), but they are also usefully referred to as read/write web applications. The use of the term 'read/write' emphasises an approach rather than a toolset and stresses the marriage of broadcast and interactive tools within a personalisable environment.

These applications afford opportunities for: social networking, using software like Facebook and Ning.com; social bookmarking, using tools like del.icio.us and Ma.gnolia; user-generated content, using blog and wiki software; virtual representation in worlds like Second Life; the syndication of content including multimedia; and innovative approaches to content and application-handling, including mash-ups and aggregation. Their impact has prompted practitioners to re-evaluate curriculum delivery, if not yet its design, and Sharpe (2006, p. 16) has highlighted that:

> *This shift creates an era of opportunity for education. At the heart of education and learning lie the encounters that an individual has with people, places and things, and the opportunity each encounter presents for interaction, challenge and growth. As digital technology pervades everything around us, we can enrich each encounter to harness the global resources of the information world and of learning communities, to make it more appropriate in that moment to that individual.*

These connections are catalysed by the interplay between applications, content and people. They produce signals and feedback between users within broader associational or friendship networks, and help to shape on-line beliefs, identities and, importantly, decision-making and agency (Hall, 2008). Anderson (2007) has highlighted six key areas in which these connections between applications and users are made real: user-generated content; the power of the crowd; data on an epic scale; an architecture that supports participation; network effects; and openness in content and computer code. The openness and malleability of use of these tools empowers users to express themselves to others, and to take part in shared activities, in a variety of contexts.

The ways in which the structures of these technologies allow their application and their content to be repurposed enables socially-constructed, dynamic, hybridised and derivative knowledge to be developed. The processes of producing mash-ups and modifications to applications can be seen in both technical and cognitive terms (El-Nasr & Smith, 2006; Webmashup.com, 2007). Through the control of code that is open source or open standards, and through the integration of media presented in multiple applications, individuals have the opportunity to rethink the spaces and places in which they represent themselves (Hodgson and Reynolds, 2005; Franklin and van Harmelen, 2007). Through the reframing of individual and collective tools and artefacts an understanding of the world and a view of difference can be generated.

There are still many issues for read/write web participants to consider, around: identity presentation and formation; engagement, agency and marginalisation; privacy and security; and developing technological confidence. Anderson (2007, p. 53) pinpoints 'the need to explore further the informal, social aspects of the learning that takes place and the many issues concerning participation. We cannot, for example, assume everyone is happy working in the "self-publish" mode.' However, our engagement with read/write web tools and experiences forms part of an agenda for educational change, through the development of new spaces and contexts for enriching formal education through informal activities (Goodfellow and Lea, 2007; HEA, 2008).

3. Informal and formal education: the affordances of the read/write web

A critical space for individual learning development to occur is a formal learning environment. Eraut (2000, p. 12) defines such contexts as consisting of: a prescribed learning framework or schedule; specified learning tasks; facilitation by a professional educator; and formal accreditation, based upon external specifications. Where the rules that underpin activity in these places are framed by tutors and learners, they can enhance levels of personalisation and ownership, underpinned by personal self-reliance. In terms of technologies, institutionalised formal learning is defined by a standard toolkit, like a virtual learning environment that interoperates with institutional administrative databases, for instance student record systems. In this way, individual and group interactions and assessments can be captured, monitored and assured. The key here is that personalisation is achieved through accredited frameworks delivered in professional settings (DIUS, 2008).

The concept of informal education is contested although many would use the following terms in its description: education "owned" and "directed" by the learner; independent study; non-formally timetabled education; education using non-institutional technologies; and engaging learning that takes place away from traditional, educational contexts. The interface between traditional and non-traditional contexts or spaces has come more sharply into focus through the use of emergent read/write web and mobile technologies, which emphasise learning linked to ownership, context, personalisation and differentiated tasks (HEA, 2008). Critically, these tasks and spaces have different rules from traditional academic contexts, even if they are less structured and more open (Barnett, 2008). With users operating in multiple spaces, there are widespread affordances for personal validation, the formation of new allegiances, freeing access to varied resources, and achieving self-reliance through critical action across the boundaries of networks. Moreover, these networks and contexts are at once virtual and real.

In defining an approach to informal education Leadbeater (2000, p. 112) has argued that:

> *Schools and universities should become more like hubs of learning, within the community, capable of extending into the community... More learning needs to be done at home, in offices and kitchens, in the contexts where knowledge is deployed to solve problems and add value to people's lives*

The development of added value occurs through self-education, and through both membership of formal educational classes *and* associations with informal, external networks of people (McGiveney, 1999). Increasingly, it is the critical ability that an individual learner develops in fusing their formal and informal learning, which levers educational gains (Joseph Rowntree Foundation, 2007). This personal fusion is supported by trusted peers or practitioners and enables users to seek out appropriate personal connections between spaces, so that signals can be passed between networks, to inform action.

This provokes strategic and operational issues for higher education providers about:

- curriculum design, delivery and assessment;
- enhancing personal, technological access and participation;
- the development and ownership of personalised learning environments (PLE);
- the impact on institutional strategies for learning and teaching, estates, IT, staff development and library services; and
- the impact on staff-student and student-student relationships.

In developing strategies to manage these issues, education providers and practitioners need to address issues around control of the learning environments that they support, and enabling connections to be forged and fused with informal learning spaces.

4. Fused learning spaces

Developing the connections between formal and informal networks and spaces moves us towards an acceptance of a personalisation and ownership of the learning process that coalesces within a range of spaces, networks and applications. In this way, there is the hope that learners can develop agile agency in deploying new learning or literacies, within new contexts, and as a result enhance their outcomes. This is driven by the motivation and engagement of the learner within what can be termed fused spaces.

Fused, personal environments consist of a 'diverse range of possible technologies and applications' in both virtual and real worlds (Ibrahim, 2008, p.1), which are interconnected and enable proactive, personalised actions to be taken. They emerge from fused media, which 'can facilitate context-aware, situation-aware, multi-scale, proactive, and sign/signal-action dynamics in real time' (Fused Media Lab, 2008). Such actions are driven by closed-loop models where action is impacted by contextual, environmental triggers and a dynamic understanding of human behaviour. The connections that are fused between triggers, environment and behaviours enable signals to be passed between a user and a socio-technical system. By making sense of these signals, systems and users can learn from new experiences, better predict future outcomes and make better decisions.

In a read/write web world, this approach appears blurred by a mashing of identities and networks, within and across a multitude of spaces for sending and receiving signals. However, for specific tasks or outcomes, users make sense of their collected, personal spaces and networks, in order to perform closed-loop operations that are closely linked to real-time tasks. Ibrahim (2008, p.2) notes that these operations in both physical and virtual contexts 'can best be described as the fusion of worlds'. In extending these closed-loop, task-based strategies one can pick out the key elements of Ibrahim's fused framework that impact upon networks or spaces for personal, learning development, namely:

- A defined "focus aspect", like a personal aim or need;
- The provision of personalised signals and feedback mechanisms through interactive, social media that enable users to regulate their actions and development;
- Personal mastery over new resources, networks or literacies, which promote certainty; and
- Social or networked rules or frameworks that enable the robust management of uncertainty, whilst enabling a dynamic engagement with change.

In the fusing process, open applications and networks are connected technologically and cognitively by the individual to provide a place for action and identity formation. The most important element is the impact of feedback and signals that are passed between an individual and both their preferred media forms and their networks (Boekaerts et al., 2005). The feedback loops that occur empower users to construct ways of acting (Nicol and Macfarlane-Dick, 2006; Vygotsky, 1978), and thereby to confront and control their uncertainty about working within academic cultures, or engaging with academic tasks, or evaluating and creating academic content. Where such uncertainties are controlled or made certain, this activity positively reinforces a user's actions or decision-making processes (Barnett, 2008).

This fusion of educational spaces is itself impacted by the role of technologies. There is increasing evidence that e-learning is rarely seen as separate or special by learners and that academically they are deploying a mix of personal and institutional technologies over which they have more choice, access and control (JISC, 2007). The JISC LXP project (2007) argued that there is an increasing complexity and blurring of boundaries between the formal and informal use of technologies. In turn this facilitates advanced networking and the development of new critical literacies. As Jeffs and Smith (1990) note, separate learning environments are viewed in different ways, depending upon the information and people who operate within them, and the relationships that are formed between those 'resources' and a particular user.

In the fusing process, open applications and networks are connected physically and cognitively by the individual to provide augmented places for action and identity formation (Mixed Reality Lab, 2008). This does not produce a simulated reality; rather it enables the user to engage with real uncertainties, through participation with tasks and feedback loops. For instance, students on placement might experience enhanced project work using mobile devices and social networks. Equally, networks of users might fuse hardware, media and content to produce shared stories. The most important element is the impact of feedback and signals that are passed between an individual and both their preferred, mixed media forms and their social networks. These have the potential to augment ubiquitous, experiential learning (Educause, 2005), and empower users to construct ways of acting (Vygotsky, 1978), and thereby to confront and control uncertainty. Where uncertainty is controlled or made certain, it positively reinforces a user's actions or decision-making processes (Bandura, 1977). The ways in which a user can fuse informal and formal personal resources, networks and literacies underpins their assemblage of a meaningful PLE.

5. Assemblage of fused personal learning environments

The Ravensbourne Learner Integration project (JISC, 2008a) argues that a PLE is 'a learning environment that is assembled through learner choice'. It encompasses the personalised aggregation of tools, networks and content from a range of formal and informal places. This aggregation can exist in several places or be presented in one space, depending upon the nature of the personal tasks to be undertaken, or the specific aim to be achieved. In this way the learning context, and both the learning that takes place and the artefacts that are produced within it, are owned and controlled by the individual student, rather than the institution. The read/write web underpins this approach by dint of its user-centred, participative and networked affordances (Anderson, 2007).

The interactions between an individual and their environment lead to reciprocal determinism, ensuring that both individual and environment are changed. In this model, learning is a combination of watching, thinking and trying (Kolb and Fry, 1975). When a person succeeds in a task s/he becomes more confident and more willing to take on new operations. The situated nature of this practice is highlighted by Tennant (1999, p. 170), who stresses how expert knowledge and skill can be gained from everyday social experiences at work, and in community or family, and how personal mastery can be forged through goal-directed behaviour with appropriate feedback. Given the growing impact of read/write web technologies on educational processes, it is important to evaluate the personal impact of social tools in a range of formal and informal settings, in order to develop a critical understanding of how PLEs are assembled and fused in specific domains.

The PLE offers us a complex view of learning environments based upon differentiated user needs (JISC, 2008b). The Ravensbourne Learner Integration project (JISC, 2008a) has developed an assemblage model that focuses upon the individual's transition from private to public learning in the context of social software and communities of practice.

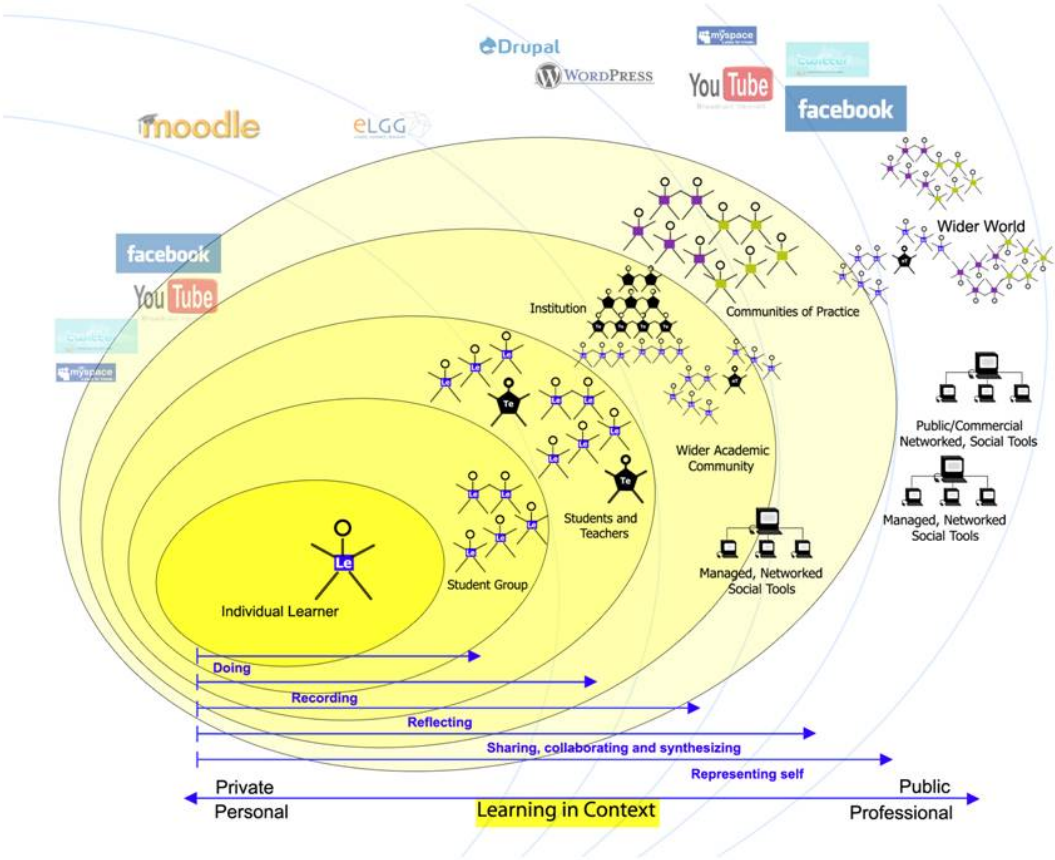

Figure 1: e-Learning in context, the Ravensbourne Learner Integration model

The Learner Integration model is important because it highlights the links between: personal mastery in specific domains; social learning in communities or associations of practice; and social media and technologies. It highlights how self-education and critical literacy are enhanced through active

participation with user-centred media and within groups that make sense to the individual. This frames a constructivist paradigm where learners can situate themselves, in order to make and record actions, to reflect on those actions, to share decisions and thoughts with others, and to represent aspects of their identity within validated networks.

Defined environments for learning are unique to each learner based on their learning aims. Moreover, they are fused from specific formal and informal associations using social media, where meaningful, rule-based signals can be processed into action. Therefore, the context surrounding the Learner Integration model is enhanced through Ibrahim's (2008) fused framework. By integrating and making explicit the elements that focus upon the development of the learner's focus aim, her/his signal processing and network rules, Ibrahim's (2008) fourth theme relating to personal ways of managing uncertainty and anxiety can be addressed. Thus, it is possible to refine the technological, social and cognitive links made by the individual in overcoming uncertainty and developing mastery. This accords with the view of Illich (1971, pp. 77-8) that the key question is not 'what should someone learn?' but 'what kinds of things and people might learners want to be in contact with in order to learn?'

For Illich education was owned by the individual in becoming a self-aware actor, and he also argued (1977, p. 31) that the questions individuals are empowered to ask coupled to the socio-technical tools available to them, supports personal emancipation. The read/write web affords tools for encouraging individuals to associate with each other in contexts that support doing, questioning and re-conceptualising (Siemens, 2008). Linking the four strands of the fused learning spaces framework into the Learner Integration model scaffolds an adaptive, environmentally-flexible toolset that furthers participation though personally-focused activity.

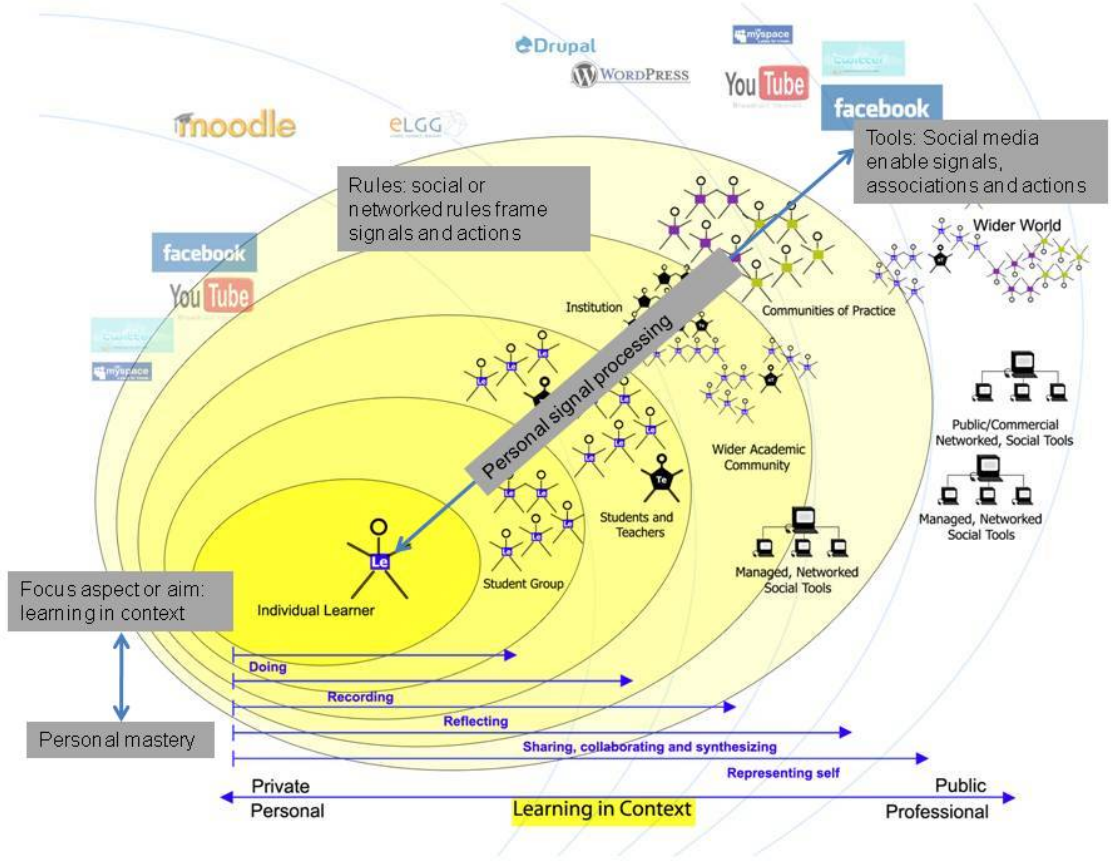

Figure 2: e-Learning in context, a Fused Learner Integration model

Individual students can develop their own approaches to conceptual mastery, and in the process of successfully modelling their learning they are able to overcome academic uncertainty. Such modelling is underpinned by their proximity to formal and informal associations, which are personally meaningful in enabling a learning aim or focus aspect to be achieved (Siemens, 2008). In turn the rules and

frameworks that are negotiated within these networks, associations and communities frame a fused learning space for making environmental sense of signals and feedback. Therefore, evaluating the personal, fused spaces in which users operate and produce is critical in understanding how the read/write web offers opportunities to extend learning opportunities in higher education.

6. A note on context and evaluation

The discussion that follows pivots around the impact on the development of fused personal learning environments of deploying read/write technologies within one UK university. The evaluation is designed to analyse conversations about emergent curriculum approaches, in order to examine how the tools provided are being embedded, and to align that view with student expectations. It focuses upon the triangulation of two data sources.

- Student evaluations: in-depth interviews and on-line focus groups with 129 students at all levels, including postgraduate, in all five University faculties between 2005-08; and
- Staff evaluations: in-depth interviews with 11 staff before, during and after they introduced read/write technologies into their curricula.

The evaluator did not focus conversations upon the implications of the read/write web for developing PLEs. Rather, the approach engaged with understanding the systematic implementation of e-learning innovations and their impact on learning and teaching, in order to support the critical, reflective, accountable, self-evaluative and participative improvement of practice (Zuber-Skerritt 1992, pp. 14-17). Thematic content analysis was used in order to unpick and capture the emergent themes from the interviews. The interviews were conducted and the coding scheme was framed and tested by the same evaluator in order to maintain an internal consistency of approach. The coding scheme was iterated over time using two separate samples of ten interviews, and tested by a peer working in a clinical psychology context (Boyatzis, 1998; Joffe and Yardley, 2004).Thus, this latitudinal evaluation examines what students say about the impact of the read/write web on their learning experiences, in order to provide a pragmatic description of their expectations for the use of those tools and approaches in the curriculum (Reason and Bradbury, 2001). This accords with the view of Reason (2003, 106) that the 'fundamental strategy of action research is to 'open communicative space' and help the emergence of 'communities of inquiry'.' This approach becomes rigorous through consensual participation. As Elliott (2007, p. 159) has noted: 'the democratic process of enquiry determines… which descriptions of the human environment, natural as well social, best enable human beings effectively to interact with it to satisfy their needs and desires.' (Elliot, 2007, p. 161).

7. Emergent outcomes

Table 1: Themes from interviews and focus groups with students in 2005-08 on their experiences of e-learning in the curriculum (129 interviewees)

Outcomes 1: personal ways of managing uncertainty through contextual control [aligned with the Tools of the Fused Learner Integration model]	Number
A focus on personal boundaries for an environment: use of terms like 'involvement', 'conversations' and 'agreement'	45
A focus on personal control of tools: discussion of terms like open access technologies, variance of use and shared communication	71
Outcomes 2: networked rules for access and participation [aligned with the Rules of the Fused Learner Integration model]	
A focus on dialogue between networks of learners-as-peers, and learners-with-tutors	39
A focus on aspects of access and participation between networks of learners-as-peers, and learners-with-tutors	62
Outcomes 3: interpreting signals through associations [aligned with the Personal signal processing of the Fused Learner Integration model]	
A focus on the impact of collaboration through technologies on specific academic tasks	44
A focus upon feedback on specific academic tasks, supported by technologies	49
Outcomes 4: towards a focus aim of critical literacy [aligned with the Focus aim and Personal mastery of the Fused Learner Integration model]	
A focus on personal domain-specific learning outcomes	65
A focus on personal ontological outcomes	32

The conversations with students and staff about the read/write web were designed to test assumptions about the personalised use of these tools. However, only a subset of interviews developed in directions whereby a dialogue could open up and be classified in terms of the Learner Integration model or the developmental aspects of the fused model. As such, appropriate themes emerged from the categorisation of what students and staff themselves said about its broader influence on their learning and teaching. This categorisation of conversations with students pivoted around their discussion or use of specific terms or foci that can be interpreted to signify particular themes. Those which are captured in table 1 are those with the highest frequency.

In the scoping discussion that follows, each of these themes is linked to the perceptions of eleven staff as elicited from detailed conversations with them about innovation in the curriculum. It should be noted that the evaluator found no differences on these themes: across subject areas; between distance and local learners, or between undergraduates and postgraduates.

8. Outcomes 1: personal ways of managing uncertainty through contextual control

A focus on who sets the boundaries for a learning context is linked to who controls the types of tools that can be used therein. The control of the connections between formal and informal education is a personal enabler. One level two student noted that 'staff define the use of technologies and students expect to be told what to do.' The programme tutor believed that this was because 'they don't come in with enough ideas, but I would like this to change over time, that they talk to each other, in MSN etc. and share thoughts and values.' However, for those students who raised issues around control and ownership, a passive view was not the norm, for instance a distance learning student argued that 'I feel like we are penalised by being forced to attend [face-to-face] sessions rather than building our own independence and autonomy and authority in the workplace.' A level three undergraduate concurred arguing that 'an integrated system is the way forward – something that allows the academic and social functionality to be personalised… I think it is important to apply real-life tools to education.'

In part student expectations for more control of their learning environment are shaped by their agency and confidence in relation to the tasks and tools at hand. A first-year student argued that 'I'd like spaces to work together with people I know. I don't want to make a fool of myself with people I don't know'. Understanding the point of a tool contextualised by a learning task requires facilitated deliberation amongst a cohort, which enables students to find 'the right place' for the use of web-based tools. A third-year student had a mature view on this issue and stated 'I like personalised tools, web media, animations, YouTube and that, and I like feeds that connect them like my Firefox toolbar that has good navigation based upon my thought processes and preferences.'

Personal contextual preferences also impacted upon views of staff engagement in student-led spaces. One learner commented that 'Teachers can join Facebook, and if we ran a group maybe they could just see a small portion of your page, rather than all of your personal and professional life.' For some staff, student control of the use of non-institutional, read/write tools, and their subsequent impact on formal learning was problematic. One felt that 'many staff feel threatened and challenged by technological innovation that widens student aspirations'. A second tutor added perceptively that 'the students have discovered and use web-based [tools] – they are migrating themselves into industry toolsets. We need to adapt.' This adaptive view was also held by a student representative who argued that 'this normally explicit division between the academic and the social spaces could easily become blurred with use of Web 2.0, and therefore learners must understand where boundaries should be placed to ring-fence both the personal and academic experience these tools offer.'

9. Outcomes 2: networked rules for access and participation

The critical theme of negotiated rules for access and participation within curriculum groups emerged from the student interviews. One learner 'liked the fact that group pages were only seen by us and no-one else, and I can find out what the other group members are contributing to the work. We can then decide who to send information to'. For some students access and participation stemmed from the personal efficacy of tools that could be used both formally and informally. A level one learner highlighted that subscription was a critical means of access to the curriculum: 'not everyone will have iPhones and video or audio, but most text, and can subscribe to stuff. That way I could get critical announcements and reminders'. This places value upon a curriculum that connects individual ways of working to a personal ability to access adaptive tools and strategies.

For some cohorts of students, the use of tools outside the control of the teaching team was critical in building a rationale for access and participation. One postgraduate argued that 'we built the community between us and now I am less apprehensive about getting feedback. It removed the fear of isolation'. This was echoed by a second postgraduate: 'we need social engagement and debates about practice. In the end we set up our own MSN chat room to move to total ownership of our learning.' Both students felt that the differences between group members were overcome by a shared participation in a defined learning context.

This proactive strategy for connecting learning contexts using different read/write tools was not uniform. One level two tutor argued that this mindset takes time to emerge and that these read/write tools would affect 'participation in the formation of their own project [group] identity, [and] it will be interesting to see how this affects their overall sociability'. This type of participation, within a context that respects the differences between students and fosters a space for personal action, was echoed by a separate lecturer:

> *The Web2.0 software is 'owned' and editable by them, and they can see what each other have done and all are free to comment... what staff say has to be encouraging and of value, emotionally, technically, educationally, within a set of guidelines that promote active interest.*

The level of active interest, facilitated by local environmental control and participation, is spurred by personal proximity to relevant networks and associations.

10. Outcomes 3: interpreting signals through associations

Most curriculum interactions are fixed within institutionalised spaces. However, for some students external associations with validated others hold most value. One level two student drew these matters together:

> *I use Web 2.0 technologies because it is an interest thing. I am able to say 'I found this and what do you think?' It is a process of self-validation, to have opinions outside [the University]. I want an external view, a wider opinion on my work. This is not what people are taught, but outside experience is important in practice.*

For a sub-set of students the ability to manage their work through dialogue with non-institutional networks is critical in their own reflexive assessment of personal progress. A second, level two learner noted that 'I don't want a closed view. Making my work more abstract is important – my identity is defined externally and I like to go off on my own and work with others. I like [our use of read/write tools] as it is an extension of my way of working.' This sense of shared, open validation was important for one programme team: 'We encourage students to share their resources with others via wikis, del.icio.us, and other open applications'. This demonstrates a mastery over the intended curriculum outcomes and develops trust and validity in the production of personal and social assets.
Thus, a complex set of approaches exists in the fusion of informal and formal learning contexts enhanced by the interpretation of signals. A distance learner using synchronous classrooms noted how they 'are a good community building tool with opportunities for us to learn in teams, allowing you to gather knowledge and experience and ideas quickly and share it.' However, a level one student highlighted that the extension of personal skills in virtual worlds, like Second Life, was forged out of shared interests between wider groups of people. He noted that

> *the first thing we did was explore places that looked good and where people had already solved the problems we had. We talked to them about this about how they had solved problems. They talked to us because we were using the same language, and they could get something from us.*

One of his peers went on to argue that this impacted his creativity: 'I can understand the programming but it is the creative side that has changed, because I have had to work outside our normal group.'

This demonstrates the strength of associations based upon common interests in promoting mastery and conceptual understanding, through signal processing and trusted feedback. These associations are underpinned by personal control over the deployment of read/write technologies. A student in a different cohort noted that 'We all have MySpace sites – they are more interactive and I can get to know people or even get constructive feedback from strangers. If someone has an opinion it's great; it's simple and I get to re-think my space.' For one tutor this crystallised around the value of 'exposure

to the use of technologies in a variety of creative and discursive ways... the students do understand the tools and know about the issues.'

11. Outcomes 4: towards a focus aim of critical literacy

Developing association and participation, in negotiated informal and formal educational spaces, can enhance critical literacy. One learner highlighted how she valued 'the ability to hear other people's views and have the opportunity to express mine' but that 'I would like to see more collaboration between lecturers and students in order to make learning more interesting.' The process of sharing and modelling practice helped students manage curriculum anxieties, as one second-level lecturer highlighted:

> *The Web 2.0 software is 'owned' and editable by them, and they can see what each other have done and all are free to comment... what staff say has to be encouraging and of value, emotionally, technically, educationally, within a set of guidelines that promote active interest.*

The level of active interest, facilitated by local environmental control and participation, spurs critical thinking, and the development of collaborative strategies for managing uncertainty.
Situated support was seen as vital in enabling learners to enhance their educational experiences. A first-year student argued 'I accept that we need to move to total ownership of our learning but we still expect a graduated level of support throughout.' A peer agreed and highlighted that in developing critical literacy in a particular subject area 'our ownership of blogging tasks means that we have to get used to tagging and linking and thinking like this'. A level two tutor concurred with the use of these tools for personal ownership, arguing that 'the better students had a quality and depth of notes that went beyond a set text to produce more original thinking that was linked to a topic of personal interest. They took time to personalise their case studies'.

A separate postgraduate student highlighted the value in extending their academic writing of blogging: 'There is a much more relaxed feel about writing a blog, it's much more natural and still has the potential to raise one's writing ability.' This learner went on to argue that informal, reflective writing enhanced her critical engagement in structured teaching sessions: 'You have to read and discover and discuss these in the tutorials and so the blog complements and summarises points.' For this learner, the experience of discovery through read/write web tools helped to fuse formal and informal educational literacies and enhance her subject-specific mastery over time. This longer-term approach was reiterated by a level three student: 'I like the idea of constantly updating [the blog], so you have to think about it and develop personal ideas over time'

However, for some students simply having access to a personalised technological space is an issue in developing critical literacy. One first-year student noted that 'next year we will have broadband in the flat – it was the first thing we organised. Last year we didn't have broadband and I was [disappointed]. It is a necessity when you are at university, especially as the library is [busy] at assessment times'. These issues of technological access and marginalisation mean that universities cannot presume that all of their students are able to enhance their learning in a wide range of informal and formal educational networks. Managing the impact of technological uncertainty and anxiety on curriculum disenfranchisement is critical for higher education.

12. Conclusion

The read/write web offers ways for users to personalise their online existence, and to develop their own critical identities. User centred, participative, social networking tools enable learners to create informal associations or communities of practice, in which to develop their own subject-based mastery. By fusing web-based tools into a task-oriented PLE, students gain control over their learning experiences. Moreover, they are able to define who they share those experiences with, and to connect their informal educational lives to their formal, institutional work.This fusion is a product of control in four key areas.

- A defined "focus aspect", like a personal aim or need;
- The provision of personalised signals and feedback mechanisms through interactive, social media that enable users to regulate their actions and development;
- Personal mastery over new resources, networks or literacies, which promote certainty; and

- Social or networked rules or frameworks that enable the robust management of uncertainty, whilst enabling a dynamic engagement with change.

The structuring of personal learning spaces that enable users or social networks to manage these four areas is enhanced by read/write web approaches and tools, and can be modeled through an extension of the Ravensbourne Learner Integration model. This Fused Learner Integration model highlights the impact of personal aims, tools and rules, within closed, task-specific loops that enable signal processing to take place. In this way, one can begin to see how students can make contextual sense of their learning, develop their own approaches to mastery and extend their own learning opportunities. By utilizing these applications and their ways of working, formal and informal educational spaces can be fused, in order positively to extend participation and the development of critical literacy. As a student representative highlighted 'It is important for the learner to have control over the tools they use and to make informed choices about how to use them.' The contextual control available to learners in personalising their own learning environments, their modes of access and participation within multiple networks, and the associations that are made in those contexts enable those learners to overcome uncertainty. In this way, the read/write web can proactively shape the means for the production of educational outputs through its affordances for the creation of fused learning spaces.

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