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The influence of pervasive and integrative tools on learners' experiences and expectations of study

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Part 1
New Contexts for Learning

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The influence of pervasive and integrative tools on learners' experiences and expectations of study

SARA DE FREITAS AND GRÁINNE CONOLE

Editors' introduction

This chapter focuses its discussion on the learner's experience through a discussion around differing positions of how the use of social software and other innovative technologies are influencing the learner directly. Drawing on a range of studies and case studies, the authors note a move towards multimodal learning and that this move is well supported through the new tools. Notably the capabilities of these are leading to new and diverse models and metaphors for learning that are set to influence learning ~~over the next~~ in future years. The chapter brings together an overview of this trend and introduces some case studies from practice to illustrate the significant shifts in learning that are outlined in the move towards greater uptake of social software and immersive learning tools.

Introduction: the future for learners' experiences

The opening paragraphs of any recent policy documents are a testimony to the recognized importance of e-learning in education. As the case studies in this book also attest, e-learning models and theories, simulations, computer modelling and social software are now an integral part of most learners' experience and environment. Similarly, institutions now recognize the strategic importance of ICT and have central policies in place to ensure that there is a technical infrastructure available to support all aspects of the learner's lifecycle, from recruitment through to assessment.

Research in recent years, focusing specifically on learner use of ICT, has given us a rich picture of how learners of all ages are appropriating new tools within their own context, mixing different applications for finding and

managing information and for communicating with others. With respect to this trend, a recent report on the impact of ICT in the US, commissioned by the National Science Foundation, begins with a scenario of a learner of the near future:

> Imagine a high school student in the year 2015. She has grown up in a world where learning is as accessible through technologies at home as it is in the classroom, and digital content is as real to her as paper, lab equipment, or textbooks. At school, she and her classmates engage in creative problem-solving activities by manipulating simulations in a virtual laboratory or by downloading and analyzing visualizations of real-time data from remote sensors. Away from the classroom, she has seamless access to school materials and homework assignments using inexpensive mobile technologies. She continues to collaborate with her classmates in virtual environments that allow not only social interaction with each other but also rich connections with a wealth of supplementary content…
>
> (Borgman et al. 2008: 7)

Other policy documents echo this vision of the future that promotes a seamless interchange with ubiquitous and ambient technologies (e.g. Becta 2008; European Commission 2008). The overall picture is of a rich personalized learning environment mediated through a plethora of tools and integrated applications. The suggestion is that this provides unique opportunities for authentic, rich learning experiences and that learners are developing new digital literacy skills that will enable them to work effectively in a constantly, changing social context. Skills such as curiosity, play, inventiveness and imagination appear to be becoming more important than traditional competences such as knowledge recall, organization and domain expertise. Skills mediated by enriched experiences seem to be the order of the day, and a shift away from more text-based approaches to more rich representationally based social interchanges rings the changes. This chapter surveys the main trends with respect to social software and other innovative tools such as virtual worlds and games and considers new models and metaphors for bridging between pedagogies and tools, considering virtual worlds and digital spaces as new metaphors for exploration of learning concepts and user generated content.

To illustrate this transition, it is worth considering in a little more detail the ways in which ICT and Internet technologies have had an increasing impact in education. Pea and Wallis (cited in Borgman et al. 2008: 13) for example, suggest there are five main phases of general technological advancement. Each phase can also be considered in terms of the mediational context for learning. The first wave is simple face-to-face communication, harking back to the origins of human communication and learning such as Socratic dialogue. The second

wave is the introduction of symbolic representation (written language, mathematic representations and graphics), which act as mediating artefacts between people, each providing different lenses on the intended meaning and what is and isn't foregrounded in the interaction (see for example Daniels et al. 2007 for a recent edited collection on this). The third wave is the introduction of communicative tools such as the telephone, radio and television. Again these tools offer different lenses on intended mediation and have different associated affordances (sound, visualization, synchronicity vs. synchronicity). The fourth wave is associated with the networked computers and the Internet and the fifth is what they refer to as cyberinfrastructure including participatory technologies (which in essence equate to what others refer to as Web 2.0 technologies). Waves three to five see a progressive and dramatic increase in the types of tools available, the different ways in which users can interact and communicate and the ways in which information can be displayed, visualized, manipulated and distributed. Pea and Wallis conclude: 'We can now interact at a distance, accessing complex and useful resources in ways unimaginable in early eras' (Pea and Wallis, in Borgman et al. 2008: 13).

It is important to note that each phase builds on, rather than replaces, the previous phase, but also that the introduction of each new approach to technological usage requires a reorientation and adaption of practice to incorporate it. For example, recent alternatives to email for communication, such as Short Message Service (SMS), chat and microblogging services such as Twitter, have not replaced email but have altered the ways in which individuals communicate.

We argue that there has been a shift in the use of tools, which emphasizes the more participatory and communicative capabilities of new technological applications, such as social software tools. For example, compare typical tool functionality pre-2005 with tools today. Each shows a shift from individual to more collective use. For example, Google Documents (Google Docs) for manipulating text compared to Word, and Slideshare for sharing and presenting as opposed to PowerPoint. Whereas pre-2005 the majority of communication occurred in email, chat and forums, learners now have a much richer and more complex set of communicative tools, including social networking tools such as Facebook and Ning, SMS and microblogging services such as Twitter, and audio/video conferencing. What is powerful about these new technologies is the way in which they can be integrated across platforms and between services, so that a message can be sent once, but distributed in a variety of different ways. The nature of content, both in terms of production and distribution, then has shifted with greater control for the individual as producer and as user.

Seely Brown and Adler (2008) argue that this trend supports people with common interests, for example allowing them to meet, share ideas and collaborate in innovative ways. They argue that the so-called 'Web 2.0'

tools such as social networking sites, blogs, wikis and virtual communities have produced a new form of participatory medium that is ideally suited for multimodal learning.

So far we have argued that there has been a co-evolution of tools and their use and a commensurate increasing impact of these tools on practice. The rhetoric around so called 'Web 2.0' hints at the suggestion that the ways in which these tools are being appropriated is more than just a gradual shift to new tools and progressively enhanced technological mediation, and that in fact there are fundamental changes in practice occurring as a result of tool-user co-evolution. So whereas initial use of the Web (Web 1.0) was essentially fairly static, with hyperlinked information pages displaying information (often created by 'subject experts' and maintained by 'webmasters' and email acting as the primarily communication tool),Web 2.0 shifts towards more a more active and distributed network with user generated content and a much richer, interconnected network of communicative channels. Along with O'Reilly's original definition (O'Reilly 2005), phrases such as 'user participation' (O'Reilly 2004), architecture of participation (O'Reilly 2004), wisdom of the crowds (Surowiecki 2004) and everything is miscellaneous (Weinberger 2007) became synonymous with this practice.

In addition to Web 2.0 tools, other technologies are beginning to change practice, for example gaming technologies, virtual worlds, haptic technologies, large-scale distributed data networks and cloud computing. The annual Horizon reports (Johnson et al. 2009) paint a picture of an ever increasingly complex, rich technologically mediated environment. At the time of writing, mobiles, cloud computing, geo-everything, the personal Web, semantic-aware objects and smart objects are the top six technologies to watch (Johnson et al. 2009). Taken together, these technologically mediated contexts for learning can be characterized as:

- ubiquitous and networked;
- context and location aware;
- representational and simulatory;
- mobile and adaptive;
- distributed and interoperable.

A retrospective look at user–tool interactions in recent years indicates that there have been a number of changes in practice. The first is a shift from information being a 'scarce, expensive commodity' produced by those in authority to an 'abundance of information'. Information is no longer the provost of authoritative texts and encyclopaedia but can be produced and distributed by anyone and is available at the click of a button via Google. The notion of the nature and value of content has fundamentally changed; there is an increasing expectation that content should be free. Secondly traditional

Table 1.1 New tools mapped onto pedagogic usage

Trends in the uses of applications and tools	Pedagogical drive
New Web 2.0 practices	From individual to social
Location aware technologies	Contextualized and situated
Adaptation and customization	Personalized learning
Virtual and immersive 3D worlds	Experiential learning
Google it!	Enquiry learning
User generated content	Open educational resources
Badges, World of Warcraft	Peer learning
Blogging, peer critique	Reflection
Cloud computing	Distributed cognition

notions of authority are being challenged; many argue that the wisdom of the crowds prevails. Thirdly, content can be distributed and rendered in multiple ways: text posted in one service can be automatically made available in a range of other services; non-text based modes (such as podcasts, videos, animations and avatars) offer rich alternative methods for getting across meaning.

The description above paints a picture of a rich and exciting technological environment to support learning, with a multitude of mechanisms for rendering content, distributing information and communicating. There seems to be a tantalizing alignment between many of the social capabilities of the tools and practices evident with new technologies and what has emerged as 'good' pedagogy in recent years. Table 1.1 lists some of the key characteristics and trends associated with technologies, illustrating how these can be mapped pedagogically. What is striking about the table is that it shows the potential these technologies have to support what is currently perceived to be 'good pedagogy' (Conole 2009a).

However, despite this, there is a fundamental gap between the potential and actual uptake in the use of technologies in practice (Conole 2009b; Conole and Culver ~~forthcoming~~). 2009

- A lot of content seems to be the same; there is little evidence of innovative use of the new technologies.
- There is a spectrum of learners: good learners are able to harness and appropriate technologies effectively, whereas weak learners – confronted with so much choice – are even more lost.
- Despite the rhetoric around the notion of the 'Net Generation' immersed in technology (Oblinger and Oblinger 2005) in reality many learners don't have a good grasp of technologies – particularly not in terms of how technologies can be used for academic purposes.

Oblinger and Oblinger (2005) have made some bold statements suggesting that children born post-1980 are qualitatively different because of these changes in social behaviour. They argue that individuals raised with the computer deal with information differently compared to previous cohorts: 'they develop hypertext minds, they leap around'. A linear thought process is much less common than bricolage, or the ability to piece information together from multiple sources (p. 15).

A key argument is that the Net Generation is digitally literate – they are intuitively able to use and navigate around the Internet. It is suggested that they are more visually literate than previous generations and their approach to understanding is more surface level and multifaceted. Another claim about the characteristics of the Net Generation is that they are virtually connected and more socially orientated, as well as extrinsically motivated. The capabilities that the use of these technologies offer the learner includes immediacy, and hence learners expect quick responses to queries posted and operate very much on a 'just in time' basis.

Kennedy et al. (2008)'s Australian survey of students' use of technologies provided evidence that the trend identified by Oblinger and Oblinger (2005) was still observable, indeed with increased levels of access new uses of the tools were emerging. In terms of use of particular technologies, two patterns of response were evident. The first pattern showed those technologies the majority of students wanted or were using, such as a computer to create documents, access to the Web, a learning portal, chat ~~mechanism~~ facility and access to university administration. The second pattern was more divergent – these technologies included social networking tools, personal digital assistants (PDAs), web conferencing, Really Simple Syndication (RSS) feeds and blogs. This reinforces the observation from Seale and Bishop (Chapter 9) that there is a core set of technologies that all learners are using and that additional technologies are taken up (or not) depending on personal preferences, individual ways of working and subject-discipline differences.

An overview of key themes emerging from learner experience practice: case studies

We have conducted a review of some of the projects that are engaging learners centrally. Table 1.2 summarizes the key themes arising from the review and illustrates these with case study examples identified in the wider literature survey. This section provides a pointer to some concrete cases studies of how new technologies are being used by learners, focusing upon examples of use of Web 2.0 tools, virtual worlds, games and e-science as well as highlighting a potential impact on education.

The case studies were identified from a number of recent reviews and research reports including the NSF-commissioned study on Cyberlearning

Table 1.2 Case studies mapped by thematic area

Theme area	Case study	Brief description of case study	Potential impact upon education
Scaffolded	VEOU (Willis et al. 2004)	Virtual continuing professional development (CPD) and scaffolded support for publication	Potential to change the ways in which professional CPD is delivered, offering more tailored, personalized and just-in-time training
Open	E-Bank - towards truly 'Open research' (Cole et al. 2006)	Access to open learning materials designed to support tutors and learners alike	Democratization of education in terms of content production and delivery. Wider access to materials for casual learners and to support informal learning as a 'taster' for formal learning qualifications
Cumulative	CCK09 (Siemens 2009) – Education for free!	An experimental course in which both the content and expertise was free	What is the role of traditional educational institutions in a world in which content and expertise is increasingly free?
Social	Cloudworks (Conole and Culver, ~~forthcoming~~ 2009)	Social networking for an educational context	Social networking applied to education has the potential to change the ways in which teachers exchange information, with the potential to lead to proactive sharing and reuse of educational resources
Authentic environments	WISE project (SecondReiff Aachen School of Architecture); Stanford Medical School simulations using Olive platform (cited in Ala-Mutka et al. 2009)	Authentic real-time modelling environment in Second Life for architecture and medical students	Scope for training in new and realistic environments. Pedagogic models include exploratory learning (ELM), inquiry learning and problem-based learning approaches
Fostering inquiry learning	Personal Inquiry Project (Kerawalla et al. 2009)	Development of inquiry-based learning skills for students to enhanced their understanding of science	Through independent learning approaches peer learning is encouraged and analytical skills may be fostered

Table 1.2 continued

Theme area	Case study	Brief description of case study	Potential impact upon education
Enhancing life experiences	Mundo des estrellas (cited in Ala-Mutka et al. 2009); JISC MyPlan project (de Freitas et al. 2009)	Young people in hospitals, interactive gaming, life swapping and sharing of experience. MyPlan project providing tools for lifelong career decisions and educational choices using visualization of learners' timelines (http://www.lkl.ac.uk/research/myplan)	The potential for these tools to support lifelong learning opportunities and enhance life experiences
Broadening access	Notschool and Schome projects (cited in Ala-Mutka et al. 2009)	Notschool for virtual home schooling for disaffected children and Schome project for gifted and talented kids	The impact of this includes outreach to children and excluded, talented learners. Using familiar media based metaphors rather than traditional school based metaphors new learners may be reached
New forms of collaboration	CSCL pedagogical patterns (Hernández et al. forthcoming)	Structured pedagogical patterns to support different forms of collaborative activities	Broader application of pedagogical patterns and other scaffolded forms of pedagogical have the potential to transfer good practice from research into practice in an effective way. Automation of such patterns can be embedded in pedagogy tools
Co-construction of understanding	Wlker's Wikinomics (cited in Ala-Mutka et al. 2009), The Decameron Web (http://www.brown.edu/Departments/Italian_Studies/dweb/dweb.shtml)	Collaborative co-construction of understanding of economics	Blurring research and teaching: examples of how the Web can provide access to scholarly materials and give students the opportunity to observe and emulate scholars at work
Aggregating and sharing content	Wikipedia	Co-construction of knowledge through collaboration and iterative development	New tools provided for learners at all stages, and interaction between learners and publication of shared knowledge

et al.

(Borgman 2008), the IPTS reviews of 'Learning 2.0' in formal and informal contexts (Ala-Mutka 2009), along with individual case studies that exemplify different facets of technology appropriation. The examples selected have been summarized in Table 1.2 to indicate the breadth and variety of uses of Web 2.0 tools. In each case a brief description is provided, along with an indication of potential impact.

New models and metaphors for analysing and enriching learner experiences

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This review of learner experience literature and practices indicates that we need to devise new models and metaphors for understanding learner and teacher interactions with technologies, along with new pedagogical models that can help guide the design of effective and innovative learning interventions. In this section we describe a number of models and metaphors that have been developed. This is very new research work, the examples provided are put forward mainly as examples of thinking and visualizing technology-enhanced learning differently. We suggest that further work is needed to fully explore how these can be used to guide both the design and enactment of learning experiences occurring in technology-enhanced learning environments.

We argue that traditional time–space based metaphors used to describe technologies and users' interactions with these technologies are no longer adequate to describe the rich, multifaceted ways in which practices are now being shaped by technologies and the complex, distributed nature of the associated temporal-spatiality:

> There is a need for new approaches to help navigate through the digital environment and also to help make sense of it and the impact it is having on our lives. Simplistic descriptions of the digital environment replicating physical spaces are no longer appropriate, it is necessary to take a more holistic view and describe technologies and users together emphasising the connections between them.
>
> (Conole 2008)

We argue that spatial descriptions of digital spaces quickly evolved in the early stages of the Internet – the concept of 'virtual universities' was born with associated virtual cafes, libraries and lecture halls trying to mimic real-life educational spaces. However, it is also evident that as we have co-evolved with these tools, use has become more complex, and more temporal spatial fragmented suggesting that there are four foci to describing digital spaces (Table 1.3). A consideration of these in combination can provide a richer, more accurate description of use of tools.

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Table 1.3 Descriptions of digital space

Focus	Aspects of the digital space this emphasizes
Spatial	Made up of objects that are connected in a typology of hyperlinks
Temporal	Evolving over time, with events happening over different time frames
Functional	Represented as the different functions of the tools; tools acting on 'data' in the system leading to transformation in some way
Connected	A connected network of different types of objects (tools, resources, people) interacting

Pedagogies of the future

New models and metaphors are emerging to provide a conceptual basis for the kinds of changes going on that relate to education and training practices, as highlighted above. While these changes are clearly more socio-cultural than technologically based, nonetheless they have presented tutors and the wider policy development community with real challenges. The speed of uptake of the new social software and game-based tools has been ~~significantly~~ *sufficiently* rapid to merit conceptualizations and conceptual models that are prepared on the fly, rather than developed incrementally over long periods of time. This has led to a whole set of challenges that we are only now beginning to meet. The main issues of speed of uptake and the general model of user-led innovations and validations of software tools, coupled with the pervasiveness of the Web and broadband connectivity, alongside service-orientated architectures that allow us to integrate technological applications more easily together, have collectively led to significant changes in education. The lag between research and tool use and the relative lack of critical and conceptual models have jointly been problematic. ~~however~~, *However* generic sets of approaches are emerging and here we outline examples of such conceptual models that may be deployed to help evaluate and validate new tools and applications.

We have previously used a four dimensional framework (de Freitas and Oliver 2006) as a specific toolset for tutors using games and simulations in their learning and teaching practices. The framework originally envisaged as a tool for selection of games has since been tested to support the design, use and evaluation of serious games (games for educational purposes) (e.g. de Freitas and Jarvis 2008). The framework has, however, a wider applicability for approaches that combine learning design and participatory approaches involving the active participation of learners. The 'dimensions' include the learner, the pedagogies used, the representation selected and the context within which learning is grounded. Notably here, representation is an increasing area of interest as the social software and simulation tools become more prevalent ~~as~~ cheaper and easier to access, and as the processes of learning and knowledge exchange, social interactivity and networking become more complex.

The learner dimension in turn becomes a more active mode of engagement with role play and game-based approaches, and the interaction between social actors in the process of learning. In particular the interchange between learners in the cycle of peer learning underpins this social dimension. The pedagogies used in terms of learning theories and models and approaches taken similarly play a central role in the process of learning as a whole. The context of learning is central to the selection of learning tools used and processes adopted. Where learning takes place as much as how learning takes place can have an impact upon the learner cohort and place constraints or freedoms upon the social interactions taking place. Whether the context is considered in terms of access to materials, location and place of learning or disciplinal framework used, it is undeniably a central aspect of the learning interchange both individually and in group work.

These four dimensions serve to highlight the main processes of learning design and foreground a dynamic and changing nature of learning, as well as highlighting the social interactive dimension of learning that the teachers and tutors are serving to support. The model can also be used in non-tutorial contexts to evaluate and measure the effectiveness of learning content, the learning design process and innovative approaches to learning (e.g. game-based, social software).

In other work, we have used pedagogical schema to guide learning and teaching (Conole 2008) and we have argued that these can be used as guidance to help both effective design of learning interventions, and in particular how technologies can be appropriated, as well as guidance during the learning process. One of these provides a conceptual map of the learning process, enabling the learner to focus not so much on the tools but *how* they are being used. Any learning intervention consists of four interrelated facets:

- thinking and reflection;
- conversation and interaction;
- experience and activity;
- evidence and demonstration.

A second tool, the pedagogy profile, focuses more on providing support for mapping a set of learning activities in terms of the types of tasks the learner is undertaking. The work derives from a learning activity taxonomy (Conole 2007) that characterizes the types of tasks learners undertake into six types: assimilative (attending and understanding content), information handling (e.g. gathering and classifying resources or manipulating data), adaptive (use of modelling or simulation software), communicative (dialogic activities, e.g. pair dialogues or group-based discussions), productive (construction of an artefact such as a written essay, new chemical compound or a sculpture)

and experiential (practising skills in a particular context or undertaking an investigation).

In addition, to these conceptual models, wider metaphors are also emerging worthy of consideration. One such approach being investigated in the UK (at the Serious Games Institute, UK) and in the 'Spaces for Knowledge Generation' project in Australia (http://www.skgproject.com/), is the concept around 'smart spaces' and 'hybrid spaces'. These projects are extending the spatial metaphors beyond current usage and into new areas of application. For example, in the smart spaces project at the Serious Games Institute the more seamless use of real and virtual spaces is being engineered with industrial partners using bridging technology that allows changes in real spaces to be reflected in virtual spaces and vice versa. The applications are being used primarily for environmental controls and monitoring purposes, however, the potential of the integrative approach to open up new concepts and metaphors of space and our social interactions within different spaces is clear. The work in Australia is exploring how new technologies might be better appropriated to enhance learning both on campus and virtually. Themes include 'designing more effective collaborative learning spaces', 'sunburnt wifi: what makes a really great outdoor learning space?' and 'the corners of our minds – how should we be using eddy spaces' (i.e. reconceptualizing current 'dead' spaces).

Virtual worlds as metaphors for learning

The new virtual worlds themselves open up scope for new and multiple uses of metaphors for learning, whether these are taking literal representations of current training situations such as in the Olive training example where Forterra's OLIVE (Online Interactive Virtual Environment – 1.0) platform allows developers to build and maintain persistent virtual worlds, supporting users for training, rehearsal and analysis. Or indeed whether the virtual world is being used as a classroom for learning interactions such in the Seely Brown and Adler 'Terra Incognita' project of the University of Southern Queensland (Australia), which has built a classroom in Second Life, the online virtual world that has attracted millions of users. In addition to supporting lecture-style teaching, Terra Incognita includes the capability for small groups of students who want to work together to easily 'break off' from the central classroom before rejoining the entire class. Instructors can 'visit' or send messages to any of the breakout groups and can summon them to rejoin the larger group.

The scope for using virtual worlds to 'play' with our conceptions of learning and to interrogate these conceptions in different contexts is only now being explored in education.

In addition to new metaphors of learning space, new and specific pedagogical angles on technology use are emerging to help tutors and institutions deal with the kind of rapid changes that are predicted for future

learning provision, and with a particular focus upon letting the learner's voices become part of the design of learning. The ways in which technologies can be harnessed to personalize learning is a strong part of current rhetoric. O'Donoghue (forthcoming) provides a summary of cases on this. The vision is that technologies can enable a more personalized delivery of learning according to learner requirement and profile. Similarly there is now considerable interest in exploring how technologies can facilitate more inquiry-based approaches to learning. (See for example the Centre for Inquiry-based learning in the Arts and Social Sciences, http://www.shef.ac.uk/cilass/home.html, and the personal inquiry project, http://www.pi-project.ac.uk/.) These indicate the necessity of learner-led approaches, and imply a greater emphasis upon social interactions as part of the process of learning and assessment.

Inevitably, this leads us to consider not only the roles of tutors and learners but also the learning models that will be used to support onward development. As Walker and colleagues point out, in this volume (Chapter 15), the concept of skills can be unhelpful as it can lead to a separation of learning approaches, which can be problematic, as in real lived practice often skills need to be integrated together, for example for decision making. The roles of tutors and learners do seem to be altering with the adoption of e-learning approaches, in particular the relationships between learners seems to be strengthening, leaving the tutor in a more mediatory role.

The new pedagogic models that reflect social learning are beginning to emerge such as the exploratory learning model (ELM), (de Freitas and Jarvis 2008; de Freitas and Neumann 2009) and reflect a greater emphasis upon the social dimensions of learning between peers. However, as pointed out in the earlier volume of this series, models that support social interactive learning are still relatively sparse leading to a need for more conceptual modelling and better critical categories for complex social interchanges (Mayes and de Freitas 2007). Methodologies such as 'social network analysis' (e.g. Wasserman and Faust 1994) may perhaps provide new approaches for developing new learning theories and approaches, whilst other directions of study focus upon neurological processing and demonstrate some potential for further opening up this difficult and complex area of how we learn (e.g. Rebolledo-Mendez et al. 2009).

Conclusions

This chapter has opened up some of the key questions and themes associated with learners' experience and voice, while outlining some of the key challenges facing education as a whole (see Table 1.4 for a summary of these). The vision of the future learner as proposed at the outset of this chapter has been broadly supported by the review undertaken by the authors. Indeed the sets

of changes impact upon the individual learner as much as the fabric of the educational institutions.

Indeed these changes that are affecting the role of learners as more active participants in their lifelong learning journeys reflects a wider socio-cultural trend of democratisation of the education system. However, the resulting greater complexity that we experience in our everyday lives driven by greater opportunities to learn in different places and different ways has the real potential to dilute the quality of learning experiences. This 'double bind' of more opportunities and less quality needs to be considered critically if we are to adapt our education systems to maximize our learners' skills and qualities, future opportunities and enthusiasm for learning. Indeed, the notion of 'what are the necessary skills' is a subject that is considered in Walker et al. (Chapter 15 in this volume) and is being hotly debated across the sector, e.g. are skills required specific or generic? Do we need to involve industry in the process of development of skills and education? Many of these considerations centre upon the notion of the learner, e.g. who is the learner, how can they be modelled and how can learning be customized for them? How can we best support their

Table 1.4 Mapping the changes between traditional and non-traditional modes of learning

Traditional modes	New modes	Impact of the changes
Closed private systems	Shift to broader notions of openness, e.g. Open Educational resource movement	Greater engagement of non-participating learners
	Flat but spiker worlds (e.g. Friedman, ref)	
Hierarchically organized systems of education	Multi-distributed systems of education (e.g. Weinberger, ref)	Potential for international models of education and greater distribution of learner cohorts
From individual modes	To more social modes	Adoption of more socially based pedagogies (e.g. communities of practice)
Static/passive models of the learner	More user participation and engagement	Greater reach of education into non-traditional learner cohorts. Greater scope for lifelong learning practices.
Predominantly linear and textual	More multi-modal and non-linear forms adopted	Move towards multimodality and multi-skill development
Expertise	Wisdom of crowds	Blurring between teacher and learner roles
Changing nature of the notion of content production by tutors for learners	Content production by tutors and learners	Blurred line between producers and consumers of content

future needs when there is so much debate about what skills will be needed to support our future societies; digital literacy is clearly only a small part of the skill set needed for the future by tutors and learners alike.

Additional issues raised here include: a need for consideration of the digital divide – are individuals opting in and out freely or are there still real issues to deal with in terms of access and accessibility? In this way do tools need to be personalized or made more generic, and will the market forces ultimately decide what we use and do not use in practice?

Finally, the chapter has raised the central question: how do we support new approaches to design and delivery of courses to make more effective use of technologies that lead to an enhanced learning experience? While the literature is positing change in this way, ultimately the main challenge lies in the real transition to a less tutor-led approach to learning. In the future the contexts for learning will diverge and so models of learning will necessarily be more diverse, and this will be challenging for how we evolve and use pedagogical models. Content will not be delivered to learners but co-constructed with them. This paradigm shift is only beginning to be addressed and this volume provides a starting point for this substantial revision.

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