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Gráinne Conole

Designing for Learning in an Open World

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Foreword by J. Michael Spector

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Foreword

This volume by Gráinne Conole in the Springer series entitled ‘Explorations in the Learning Sciences, Instructional Systems and Performance Technologies’ well exemplifies the aim of the series to promote dialogue across the somewhat artificial barriers that divide academic disciplines, scholarly communities and professional practitioners. The focus is on *learning design*, which she defines as designing for learning. The elaboration of learning design provided in this volume places emphasis on making the design process explicit and shareable as well as on gathering empirical evidence with regard to design processes. In order to make this kind of learning design a practical reality, she describes the context of modern education and the importance of pedagogical patterns and open educational resources along with the Web 2.0 technologies.

The book is organised into four main sections: (a) a rationale in terms of relevant theories and methodologies, related fields, and social and participatory media; (b) mediating artefacts and affordances; (c) design languages, design representations, visualisation tools and pedagogical planning tools; and (d) openness, open educational resources, online communities and Cloudworks. Recurrent themes that thread throughout the volume include (a) the centrality of design for learning and instruction, (b) the role of teachers in designing meaningful learning activities and (c) the as yet largely untapped learning affordances and potential of Web 2.0 resources.

Since the focus of the volume is on design, it is worth noting that design has in fact been a central concern in the instructional design field for many decades now. What Conole is proposing is renewed emphasis on design that takes into account new technologies and new instructional and learning paradigms. A formal approach to a design language was provided by Karl Eckel (1993) in *Instruction Language: Foundations of a Strict Science of Instruction*. In that volume, Eckel viewed instruction as an alternating sequence of teaching and learning activities that could be reasonably well specified and thus formally represented. Whilst many might be critical of Eckel’s objectification of instruction, few are likely to realise that his motivation was not unlike that of Conole’s. Specifically, Eckel believed that there was very little established and reliable pedagogical knowledge and that deficiency made it very difficult to distinguish good from bad instruction. Little was known about why a particular teacher prescribed a particular learning activity or designed a lesson a certain way. By creating a formal representation for teaching and learning activities, Eckel believed there would be a basis for progress in what he hoped would become a science of learning and instruction.

Eckel's *Instruction Language* is surprisingly consistent with the earlier work of Jerome Bruner (1966) in *A Theory of Instruction*. In that book published more than a half century ago, Bruner proposed that a prescriptive theory of instruction with specific rules could be developed that would result in systematic gains in learning. Bruner's motivation was not unlike Eckel's—to improve learning, one must improve the quality of instruction, and that can be done by making instruction more scientific. Bruner is frequently cited as a founder of constructivism, whereas Eckel is more likely to be associated with instructivism; a close and careful reading of those two instructional scientists shows that their motivation was similar (improve learning by improving instruction) and their emphasis on scientific theory and methods quite compatible. Perhaps the popular labels of 'constructivist' and 'instructivist' have little real purpose in distinguishing things that matter for improving learning and instruction.

Conole now calls for renewed and serious attention to design nearly 20 years after Eckel's proposal for a formal language of instruction and more than 60 years after Bruner's seminal work. We are still in need of a theory of instruction of the sort that Bruner advocated, and we still need to make explicit and transparent designs as Eckel advocated. Meanwhile, educational technologies have changed dramatically. Bruner wrote *Toward a Theory of Instruction* before the advent of personal computers and the Internet. Eckel wrote *Instruction Language* before Web 2.0 and networked communities of professional practice. There have been other efforts to explore the topic of design in the digital age. Notable amongst these are the works by (a) Botturi (2008), who stresses the significance of visual representations of instructional designs; (b) Gibbons (2003), who argues that designers work in different layers when designing and the different layers have different focal concerns and activities; Boling and colleagues (2004), who emphasise the interaction between illustrations and intended meanings; and Jonassen (2011), who argues that designs should be aimed at improving problem-solving abilities. These four works are cited here because they address four themes that Conole has woven together in an engaging manner in this volume: visual representations that promote transparency, layers of design with different issues and concerns, the interaction between illustrations and interpreted meanings, and designs that promote higher-order learning and improved problem solving. The notion of new technologies and social media appears throughout Conole's volume and is also prominent in the four works cited as possible elaborations on themes she has woven together in this volume.

A key issue raised by Conole in her chapter on design languages and learning design is that teachers are not skilled or adept at designing learning activities and experiences, especially those involving the affordances of new technologies. Her investigation was focused on designers and faculty at the Open University of the UK. She made use of one of the technologies she advocates as an important support tool for designers and teachers—namely, Cloudworks, which she describes in a separate chapter. It is noteworthy that her investigation included what both teachers and designers actually do. The focus then shifted to how best to support those design activities and improve learning designs that are then produced. The evidence she collected is consistent with what earlier researchers (Perez and Emery 1995; Rowland 1992) found with regard to design—that is to say that design is not a well-structured process with well-defined steps that proceeds in a linear fashion towards an established objective; rather, design can be somewhat messy, requires interactions with others who may have different areas of expertise and typically involves individual and creative perspectives. Conole emphasises the role of vision in an iterative cycle that includes visioning, gathering information, assembling resources, deploying a version, evaluating the outcomes and adapting as necessary.

There is also a discussion about design languages. Examples of design languages in music, architecture and chemistry are briefly presented to highlight desirable components of a language that supports design: context and background, beliefs and theories, and support for reflection and refinement. These high-level components are then described in the context of a learning activity, with the relevant concerns being the learners (who they are, what they know, their needs and motivation, their roles and modes of participation), the learning environment (the tools, resources, artefacts and affordances available to learners), the targeted learning outcomes (what the learners need or want to learn and be able to do and associated evidence of progress) and others involved in the process, interaction or activity. A learning activity is at the core of these four components, which means that the specific elaboration can and often should change as the learning activity changes.

The reader should recognise familiar aspects of systematic instructional planning in this chapter and throughout the volume. What is novel is the notion of a dynamic learning system constructed around individual learners and their various and varying situations. In that sense, Conole's treatment of design languages and learning design fits within what could be characterised as a systemic perspective on learning and instruction. This means, among other things, that there is emphasis on being flexible in terms of individual learners, the use of technologies and the overall approach. It is true that Conole advocates using Web 2.0 technologies when appropriate and she has made use of such a technology in developing this volume. However, her driving principle is that the evidence should drive the design. In other words, there can and should be a science of instruction, and this volume makes a valuable contribution to that science.

I close with a simple thought. Years ago, Gagné (1965) defined instruction as that which supports learning. While Gagné's evolved significantly towards a rich cognitive perspective on learning, his view of instruction as that which supports learning remained intact. The general enterprise in which Conole and those who have supported her work are engaged is the support of learning. Conole has chosen to focus on design as a critical aspect of supporting learning. It is unfortunate that the word 'instruction' has fallen out of use and avoided by many, perhaps based on the wrong-headed assumption that instruction is a rigid process with fixed steps that do not take individual learners or new technologies into consideration. The reality is that instruction—the support of learning—is an important activity. Being an instructor (helping others learn) is a noble profession. Becoming better at designing meaningful and productive learning activities is critical for sustained success. This volume should help move the discipline forward.

J. Michael Spector
University of Georgia
October 11, 2011

References

Boling, E., Eccarius, M., Smith, K., & Frick, T. (2004). Instructional illustrations: Intended meanings and learner interpretations. *Journal of Visual Literacy, 24*(2), 185–204.

Botturi, L. (2008). E^{2}ML: A tool for sketching instructional designs. In L. Botturi & S. T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 111–131). Hershey: IGI Global.

Bruner, J. S. (1966). *Toward a theory of instruction*. Cambridge, MA: Belknap Press.

Eckel, K. (1993). *Instruction language: Foundations of a strict science of instruction*. Englewood Cliffs: Educational Technology Publications.

Gagné, R. M. (1965). *The conditions of learning and theory of instruction*. New York: Holt, Rinehart & Winston.

Gibbons, A. S. (2003). What and how do designers design? A theory of design structure. *TechTrends, 47*(5) 22–27.

Jonassen, D. H. (2011). Designing for problem solving. In R. Reiser & J. Dempsey (Eds.), *Trends and issues in instructional design and technology* (3rd ed.). Boston: Pearson Education.

Perez, R. D., & Emery, C. D. (1995). Designer thinking: How novices and experts think about instructional design. *Performance Improvement Quarterly, 8*(3), 80–95.

Rowland, G. (1992). What do designers actually do? An initial investigation of expert practice. *Performance Improvement Quarterly, 5*(2), 65–86.

Preface

So what on earth prompted me to write a book on learning design? I think the origins to this work stretch back to my initial experience of teaching in the early 1990s. I started my career as a lecturer in inorganic chemistry. Soon after I took up the post, a number of my colleagues passed on some of their courses for me to take over. My experience of education was solely based on my own learning at school and as an undergraduate (essentially around lectures, tutorials and laboratory classes). I am ashamed to admit I had no knowledge of educational theories and did not even know what a learning objective was! In addition to trying to design my teaching sessions based on this woeful lack of experience, I was struggling to build up a distinct research profile using the traditional methods of data collection and the writing of papers and project proposals.

I attended a staff development session which stated that it aimed to support teachers in developing their teaching practice. It was a disaster. The session was run by a staff development 'expert', who kept talking about constructivism and other esoteric educational terms I had never heard of. At the end, I was demotivated and frustrated. The session had been no help at all and indeed was counterproductive.

I suspect my initial experience of being a lecturer is not uncommon. We are primarily recruited based on our research expertise and subject domain knowledge, not on our teaching experience. Luckily today many institutions do have in place professional induction programmes for new lecturers, to introduce them to relevant educational theories and expose them to appropriate examples of good learning and teaching practice.

Nonetheless, my own frustrating experiences planted a seed in my mind around the question: What kind of support mechanisms can we put in place to support teachers in their teaching practice to enable them to develop effective approaches to the design of learning interventions? On reflection, I think this question has been at the core of my research work over the last 20 years. It has led me through a journey of development and evaluation of different technologies and ultimately to the open learning design methodology outlined in this book.

This is an exciting time in education, which is operating within an increasingly complex societal context, one of rapidly changing technologies and increasing financial constraints. New social and participatory media have much to offer for learning and teaching. To address this challenging context, we need to radically rethink the way in which we design, deliver, support and assess learning. The tools and methods described in this book are put forward as a means of trying to achieve this, with an underlying aspiration to transform teaching practice and ultimately enhance the learner experience.

University of Leicester, UK Gráinne Conole

Contents

Chapter 1
Introduction

Overview

In this book, I will argue that in today's technologically rich context, where content and services are increasingly free, we need to rethink approaches to the design of learning activities and content. I introduce the concept of 'learning design' and argue that making design processes more explicit and shareable will enable teachers to develop more effective learning environments and interventions for learners and help make the intended design more explicit and hence shareable with other teachers and learners. It will help learners to make more sense of their educational provision and associated learning pathways. I will provide a number of illustrations of adopting a more open approach to designing learning interventions, from a set of design representations through to the use of open, social and participatory media for sharing and discussing designs. I draw on the areas of learning design, pedagogical patterns and OER (open educational resources) research to explore the creation, sharing and discussion of learning and teaching ideas and designs.

The Context of Modern Education

Many are arguing that there is a need for a fundamental change in the way in which we design and support learning interventions (Dalziel 2003; Goodyear 2005; Laurillard and Ljubojevic 2011; Lockyer et al. 2008). Furthermore, it is increasingly evident that traditional outcomes-based, assessment-driven and standardised educational systems and processes do not meet the needs of today's learners (Beetham and Sharpe 2007; Borgeman et al. 2008; Sharpe et al. 2010).

A number of triggers are evident. Firstly, there is the broader societal context within which educational sits. Giddens (1999), Castells (2000) and others describe the networked and globalised nature of modern society and the impact of the

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changing nature of societal values (including the defragmentation of the family unit, polarised perspectives on secular versus religious beliefs and changing roles for individuals and organisations).

Secondly, Reigeluth (cited in Reigeluth and Carr-Chellman 2009, p. 390) argues that we have seen a shift from the industrial to the information age, where knowledge work has replaced manual labour as the predominant form of work. Within this context, he argues that we need to place a greater emphasis on lifelong and self-directed learning. The greater complexity of modern society (both in terms of societal systems and technological tools) requires specific types of competences to make sense of and to interact within this context, such as higher-order thinking skills, problem solving, systems thinking and the ability to communicate, collaborate and interact effectively with others.

Thirdly, in terms of approaches to learning, there has been a general shift away from individual, behaviourist approaches to those that are more authentic, contextual and social in nature, as these are perceived as more appropriate to equip learners with the skills they will need to participate in a constantly changing societal context (Mayes and De Freitas 2004; Siemens 2004). Constructivist and dialogic approaches have become more prevalent, with a rich set of empirically based case studies of the application of strategies such as problem-based learning (Tedman et al. 2007), case-based scenarios (Segal 2008), role-based learning (Wills et al. 2010) and inquiry-based learning (Hill et al. 2005). In other words, it is no longer about knowing facts and procedures, but more about being able to locate and use relevant information on a needs basis.

Fourthly, over the past 30 years or so, technologies have had a steady, increasing impact on how learning is designed and supported, from the early days of programme instruction and computer-assisted learning packages through to the use of the Web and more recently Web 2.0 tools and services, online gaming environments, mobile devices and 3D environments such as SecondLife (Januszewski 1996; Reiser 2001). As a consequence, a body of research around the competences and skills needed to effectively use and interact with these new technologies has emerged. Terms such as digital literacies, information literacies and twenty-first-century literacies have been used, each with subtle nuances and different foci (Jenkins 2009; Goodfellow and Lea 2007; Lankshear and Knobel 2006). However, fundamentally the central issue is about the literacies needed to communicate with others and make sense of information (and more specifically how to do this in a digital context). Of particular note within this broader discourse, Jenkins et al. (2006; Jenkins, 2009) have identified 11 skills which they argue are necessary to interact with what they term this new participatory culture, namely: play, performance, simulation, appropriation, multitasking, distributed cognition, collective intelligence, judgement, transmedia navigation, networking and negotiation. The executive summary to the report states that 'fostering such social skills and cultural competences requires a more systemic approach to media education' (Jenkins et al. 2006, p. 4). This is at the heart of the learning design methodology outlined in this book. The aim is to present a more systematic approach to educational design taking account of all the stakeholders involved in the process.

To sum up, because the context of modern education is rapidly changing, traditional approaches to the design and delivery of learning interventions are being challenged and may no longer be appropriate to meet the needs and expectations of today's learners. New pedagogies and innovative use of technologies seem to offer much promise in terms of providing new, exciting educational experiences for learners. However, in reality there is little evidence of this happening. As Rogers argues (Rogers 1995), educational innovations, in both pedagogical approaches and innovative use of technologies, remain the remit of educational innovators or early adopters; there is little evidence of mainstream adoption, and indeed depressingly, taken as a whole, the majority of educational offerings are still based on fairly traditional approaches, with a primary focus on content and assessment of outcomes, delivered via traditional didactic approaches.

The Nature of Educational Technology

Research into exploring how technologies can be used to support different pedagogical approaches has a long history, but really started to expand with the emergent of educational technology as a research field in the 1960s. De Vaney and Butler provide an overview of the field, its founders, key trends and areas of research focus (De Vaney and Butler 1996).

Molenda (2008) states that educational technology as a field has developed through a series of phases as new technologies have emerged. Its origins are in the use of visual and audiovisual systems, then radio, television, teaching machines, the design of instructional systems, computers and ultimately the use of the Internet for both storage and processing of information and communication.

Spector (2008, p. 12) argues that the foundations of educational technology include: the psychology of learning, communications theory, human-computer interactions and instructional design and development. The work of both Dewey (1916, 1933, 1938, 1949) and Vygotsky (1962, 1978) are drawn on extensively in educational technology research. Dewey argued that in terms of how we think, we need to understand the nature of thought to be able to devise appropriate means and methods to train thought. Vygotsky argued that all learning involves language (cited in Spector 2008, p. 24) and of course his concept of mediating artefacts has been drawn on extensively in the field. I will return to the way in which we are using the concept of mediating artefacts in our learning design work in Chapter 5.

The educational technology field has developed and is defined in many respects by the nature of and interaction with technologies. There has been a paradigm shift in the field due to new thinking around learning theories from behaviourism, through cognitivism and finally constructivism (Mayes and De Freitas 2004). These theories led to the development of particular uses of technology designed to support the underpinning principles of the theories. I will return to this in Chapter 14. For as long as there have been technologies, there has been a rhetoric around their potential use in education and also the associated challenges with uptake. Molenda (2008) observes that the barriers cited for the lack of use for audiovisual tools in the 1940s/1950s are similar to those cited for lack of use of computers in the 1990s, namely: accessibility issues, lack of training, unreliability of equipment, limited budgets and the difficulty of integrating technologies into the curriculum. Despite the promise of technology, we have not seen it revolutionise education (Beabout et al. 2008, p. 620). This was also a point forcibly made by the much cited book by Cuban (1986), who reviews the use of technology from the 1920s onwards. His central argument is that despite the policy directives on more use of technologies in classrooms, technologies have not had a significant impact on classroom practice. It seems that although the technologies may change, the barriers and reasons for lack of uptake remain much the same.

Later in this book, I will argue that new approaches to design are needed for teachers to make effective use of technologies and for learners to productively navigate through complex digital landscapes. Graaser et al. (2008, p. 212) suggest that most students do not know how to use advanced learning environments effectively, so modelling, scaffolding and feedback on their optimal use are necessary. This resonates with recent research into the ways in which learners are using technologies (e.g. see Sharpe et al. 2010). A number of authors have argued that new digital literacies skills are needed to make sense of new technologies, such as Jenkins et al. (2006; Jenkins 2009). Similarly in terms of teachers/designers, it has been suggested that the term instructional design should be replaced with learner/learning design (Kalantzis and Cope 2010; Sims 2005).

Today's Learners

The Internet and associated technologies have been around for over 20 years now. Networked access and computer ownership are now the norm, at least in the developed world. As such the context within which today's students learn is radically different from the context for learning in the past (Oblinger and Oblinger 2005; Prensky 2001a, b; Tapscott 1998a, b, 1999, 2008); see Sharpe et al. (2010) for an edited collection of research on learner's perceptions and use of technologies. Some argue (Oblinger and Oblinger 2005; Prensky 2001a) that these learners are technologically immersed and as a consequence learn differently through technologies. Others are more cautious, arguing that although these students may be digital savvy, they do not always know how to use the technologies effectively for academic work. Furthermore, they are not a homogenous group; they vary in terms of their technology skills, the ways in which they use technologies and their preferences for which technologies to use or not (Conole et al. 2008; Jones 2011; Kennedy et al. 2008).

Despite the different views on how learners are using technologies, there is no doubt that there is a plethora of technologies that can be used to support learning, offering different ways in which learners can communicate with each other and their tutors and providing them with access to interactive, multimedia content. The so-called net generation (Tapscott 1999) has grown up in this technologically rich environment. There has been a lot of hype about how this generation is used to and comfortable with using a range of technologies to support all aspects of their lives (Sharpe et al. 2010). However, these generic skills do not necessarily translate seamlessly to an academic learning context. Appropriation of these technologies for academic purposes requires specific skills (Jenkins et al. 2006; Jenkins 2009), which means that the way in which we design and support learning opportunities needs to provide appropriate support to harness the potential of technologies. The diversity of offerings available to learners also means there is more potential for them to get lost and confused, more than ever before learners need supportive 'learning pathways' to enable them to blend formal educational offerings, with free resources and services. This requires a rethinking of the design process, to enable teachers (used in the broadest sense here, from those in K-12 through to tertiary education, as well as designers/trainers in more commercial settings) to take account of a blended learning context.

The Need for a New Learning Design Methodology

The emergence of so-called Web 2.0 tools has shifted practice on the Internet away from passive information provision to active user engagement (Fig. 1.1). This new learning context raises some thought-provoking issues. In a world where content and services are increasingly free, what is the role of formal education? What new teaching approaches and assessment methods are needed? How can we provide

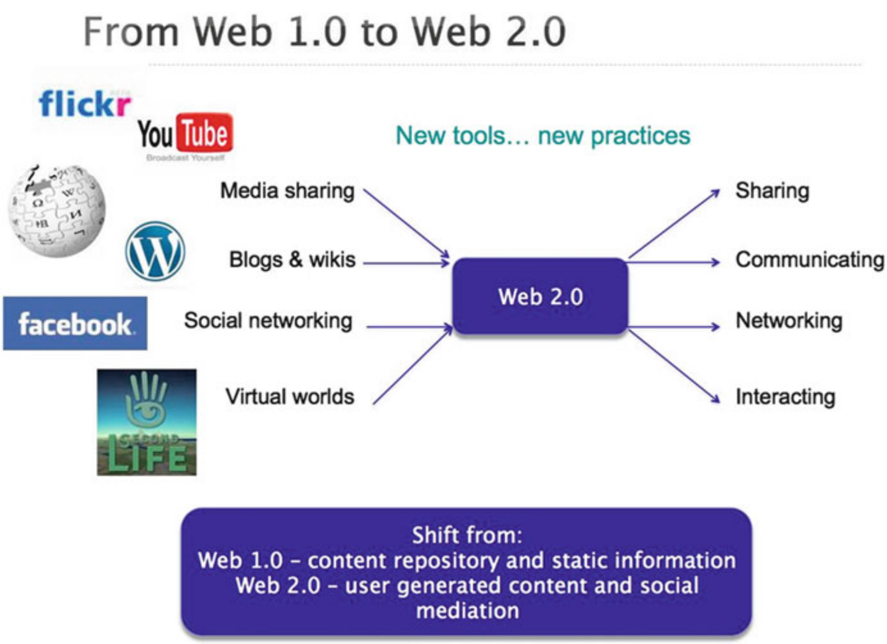

Fig. 1.1 The shift from Web 1.0 to Web 2.0

effective learning pathways to guide learners through the multitude of educational offerings now available? How can teachers develop new approaches to the design of learning activities and whole curricula that takes account of this new complex, technologically enhanced context? What assessment strategies are appropriate?

The gap between the potential and actual use of technology is a paradox and this is at the heart of the growth of a new area of research that has emerged in recent years. Learning design research aims to better understand this mismatch. It focuses on the development of tools, design methods and approaches to help teachers design pedagogically effective learning activities and whole curriculum, which make effective use of technologies.

A key theme across this book is the centrality of design as an approach to the development of more pedagogically innovative learning activities and resources, which make effective use of new technologies. The book describes the design processes and reviews the range of approaches that have been developed to support more effective design practices. These approaches include learning design, the promotion and use of pedagogical patterns and open educational resources (OER), as well as the more traditional instructional design.

The book introduces learning design as a methodology for designing for learning in an 'open' context. I argue that it is no longer possible for any one teacher to be an expert in knowing about all the ways in which technology can be used to support learning or be aware of all the latest innovative learning activities or resources that are freely available. Drawing on the research we have been doing in this area, along with related research in the learning design field and closely aligned research areas (in particular work on pedagogical patterns, open educational resources (OER) research, the learning sciences and instructional design), I will argue that there is a need for a more formal approach to designing for learning, specifically that we need to shift from the traditional craft-based teacher design (where design draws on practice and is essentially implicit) to a more systematic, explicit design approach, drawing on empirically derived and validated tools and methods for design (Fig. 1.2).

I will describe the tools and resources that can act as mediating artefacts (MAs)[1] to support teachers in making informative design decisions. (For a fuller description of how the term mediating artefacts is being used in this context see Conole 2008). I will show how the research we have been doing demonstrates the value of adopting a more open approach to the design process, to enable teachers to represent, share and discuss learning designs with each other and with their students.

To my knowledge, this book will provide the first single-authored coherent overview of learning design as currently conceived. The book will draw in particular on the research work as part of the Open University Learning Design Initiative (OULDI).[2] However, it will also locate this work within the broader context of design research from across the learning sciences and instructional design fields. The work we are doing as part of the OULDI is at the forefront of research in this field. We have developed a range of innovative tools and design methods, which are generating a

[1] This term is discussed in more detail in Chapter 5.

[2] http://ouldi.open.ac.uk

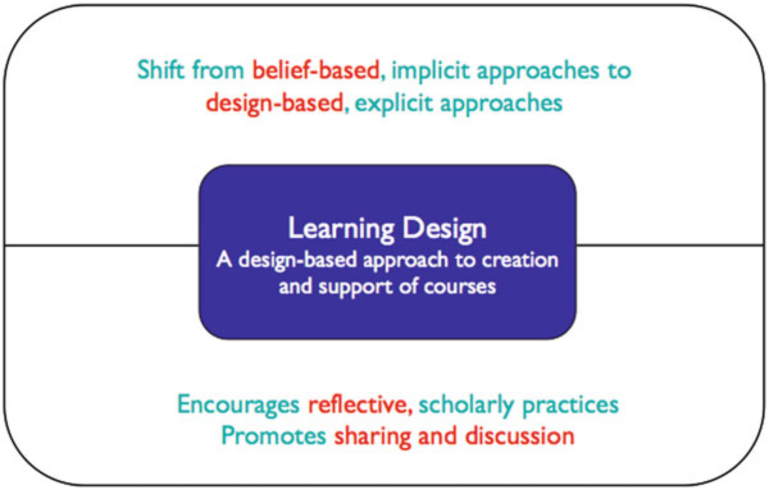

Fig. 1.2 The essence of learning design

lot of interest in the field. We have an evolving learning design toolbox,[3] which gives some indication of the scale of our work.

The book aims to provide a coherent overview for this work, along with a theoretical underpinning and contextualisation with related research in the field. The book also aims to provide a balance between the theoretical underpinnings and innovative tools, methods, practical examples and case studies. I will articulate my position in terms of designing for learning, through a definition for the concept of learning design by introducing the notion of adopting a more open approach to the design process. The book will show that the theoretical underpinnings to this work are essentially sociocultural in nature (Daniels et al. 2007; Engeström et al. 1999), through articulation of the range of mediating artefacts (MAs) that can be used to support and guide the design process.

Learning Design: A Definition

Learning design as a term has been used in a number of different ways; this book clarifies these different perspectives, positioning the approach I take as being about 'designing for learning'. I define learning design as follows:

> It is a methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies. This includes the design of resources and individual learning activities right up to curriculum-level design.

[3] http://cloudworks.ac.uk/cloudscape/view/1882

> A key principle is to help make the design process more explicit and shareable. Learning design as an area of research and development includes both gathering empirical evidence to understand the design process and the development of a range of learning design resources, tools and activities.

The book will provide a rich basis for critiquing design considerations in learning and instruction. It will make clear both the distinctiveness of learning design as a research inquiry and also demonstrate how it is related to and builds on other design work from the fields of learning sciences and instructional design.

Audience

The book will be of interest to researchers and practitioners in a number of fields, including educational technology, learning technology, education and open and distance education. The primary audience is researchers in the field of technology-enhanced learning/e-learning. This includes those with a broad interest in researching the use of technology in learning and teaching, as well as individuals with more specialist interests, in particular the research areas of instructional design, learning design, pedagogical patterns, the learning sciences and OER research. More broadly, the book will have appeal to researchers in a number of related fields such as computer science, education, information sciences and psychology. I see this book as marking an important turning point for research in this area.

It will be of broad interest to a number of audiences given the increased use and impact of information and communication technologies (ICT) in education. It should also be of interest to researchers undertaking masters and Ph.D. programmes in the field. In addition, I anticipate that it will be of use for new lecturers undertaking teaching induction programmes. It will also be of relevance to masters in computer science, education, business studies and psychology, for example. This will also be of value to consumers of research such as managers and policy makers. In addition, because the book covers both the theoretical and practical aspects of the subject, it will also be of interest to those with a support role in institutions, such as learning technologists, instructional designers, educational developers and librarians.

The book sits at the intersection of a number of research fields and attempts to tackle one of the key challenges facing education—how can teachers design innovative learning experiences for learners in an increasingly technology-enhanced context? A central argument that will be developed in the book is that effective and systematic approaches to design are essential in today's complex, technologically rich learning context. Teachers need tools and methods to help guide them to make informed decisions about their designs. As such teachers more generally should find this book valuable, in particular the description and case studies of a range of specific tools and design methods.

Finally, the book will look at design from the perspective of different levels of granularity (from the design of small-scale learning activities through to whole curricula design) as well as across the whole design life cycle (from initial concepts through to evaluation). I will argue that in most institutions, current structures and processes are woefully inadequate to take account of the affordances[4] of new technologies and that effective design using new technologies will require a radical rethink of the whole curriculum process. This has significant implications for institutional strategy and policy. As such the book is likely to be of interest to those in managerial roles within institutions as well as policy makers.

Structure of the Book

The book consists of four main sections. Chapters 1, 2, 3, and 4 set the scene for the book, including a rationale for the book, a review of theoretical perspectives and methodology, a description of related research fields and a review of social and participatory media. Chapters 5 and 6 articulate the underpinning theoretical perspectives, in particular the concepts of mediating artefacts and affordances. Chapters 7, 8, 9, and 10 discuss design visualisations, tools and pedagogical planners. Chapters 11, 12, and 13 critique the notion of openness, one of the central themes of the book, and give an overview of current open educational resource (OER) research and initiatives. Chapters 14 and 15 discuss social and participatory media. Finally, Chapter 16 provides a summary of the themes and key concepts of the book and concluding remarks and reflections. Figure 1.3 provides an overview of the key themes.

The book begins with this chapter, which has provided an introduction to the book and a rationale for its relevance. This includes an overview of the context of modern education. I have argued that we now operate in a context of rapid technological

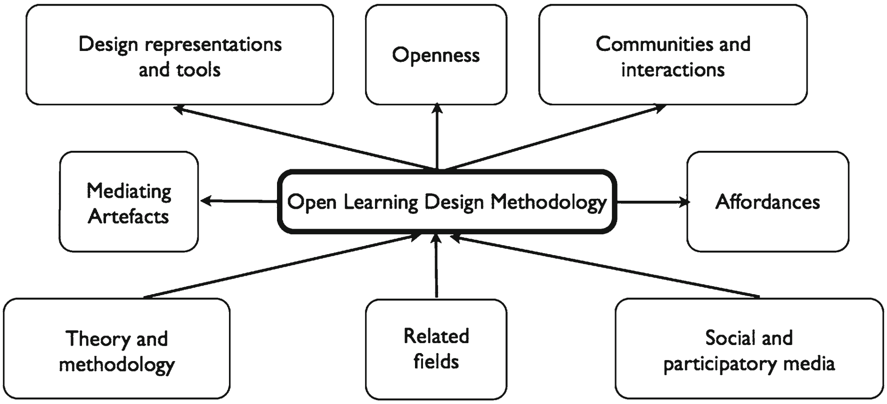

Fig. 1.3 An overview of the key themes

[4] This is discussed in Chapter 6.

change, which is influencing the nature of education and its purpose. Boundaries between formal and informal learning are changing; as a result, I argued that, within this context, the way in which we design, support and assess learning needs to change to take account of the use of new technologies. Next, the characteristics of today's learners were discussed drawing on key research in the field. It provided a brief definition of the term 'learning design' and argued for the need for a new learning design methodology, which is the main focus of the book. Finally, the audience and structure of the book were described.

Chapter 2 describes the key theoretical perspectives and methodologies that underpin learning design research. It articulates the feeder disciplines and associated research approaches, arguing that the field is inherently interdisciplinary in nature.

Chapter 3 situates the open learning design methodology discussed in this book in relation to related research fields such as the learning sciences, instructional design, pedagogical patterns and open educational resources (OER).

Chapter 4 provides a review of new open, social and participatory media and gives examples of how these are being used to support different pedagogical approaches. It considers the changing digital landscape of education and provides a review of new technologies, which includes: (1) the characteristics of new technologies, (2) the impact of Web 2.0 technologies, (3) the use of Web 2.0 technologies in education and (4) the impact on practice. Highlights from a review of Web 2.0 tools and practices are then discussed (Conole and Alevizou 2010).

Chapter 5 defines mediating artefacts, including the different ways in which practice can be captured and represented. It describes a range of mediating artefacts and concludes with an illustrative example that demonstrates how an OER created for use in one context can be repurposed.

Chapter 6 introduces the concept of affordances, discussing the range of definitions for the term. It goes on to articulate the affordances of technologies and argues that these can be used as a means of structuring and guiding the use of particular technologies for different learning interventions.

Design languages are the focus of Chapter 7; in particular, the use of design notation in music, architecture and chemistry is described. The chapter discusses the challenges of designing for learning and then focuses on learning design, along with the spectrum of learning design languages that have been developed. The origins of the OU Learning Design Initiative are described, along with a description of how OULDI adopted a design-based research (DBR) approach.

Chapter 8 begins with a description of the ways in which practitioners currently go about designing learning interventions. It then gives an overview of different design representations and how they can be used to promote new ways of thinking about designing learning interventions.

Chapter 9 describes the different tools that can be used to visualise and represent designs and in particular describes the CompendiumLD tool that we have developed. The other tools described are the Learning Activity Management System (LAMS), WebCollage and CADMOS. The ways in which generic tools can be used to visualise designs are also briefly described.

Chapter 10 reviews a number of pedagogical planners that have been developed to guide practitioners in making informed learning design decisions. These include the DialogPlus Toolkit, Phoebe, the London Pedagogical Planner (LPP) and the Learning Design Support Environment (LDSE). These planners, the chapter argues, provide more structured support for the design process than the visualisation representations and the use of social and participatory media discussed in other chapters.

Chapter 11 critiques the notion of 'openness' in terms of open design, delivery, evaluation and research. Chapter 12 provides a review of the open educational resource (OER) movement. This includes a review of OER initiatives and a description of four illustrative examples. Chapter 13 discusses the outputs and findings from the work being undertaken as part of the OLnet and OPAL initiatives.

Chapter 14 returns to the ways in which open, social and participatory media are resulting in new forms of online communities and interactions. It defines the terms and looks at different pedagogies of e-learning. It concludes with the introduction of a new community indicator framework (CIF) that can be used to guide the design and evaluation of new social and participatory media.

Chapter 15 describes the learning and teaching social networking site, Cloudworks,[5] and in particular the ways in which it is promoting new forms of online interaction, communication and collaboration.

Chapter 16 is the conclusion chapter, which provides a summary and overview of the book. It also looks at the implications of this work, along with reflections on its importance and the associated challenges.

The Process of Writing the Book

The writing of the book was intended to be adventurous, in terms of adopting an open approach to the process. This consisted of an ongoing series of blog posts about the book on my blog.[6] These posts included initial ideas around the nature and scope of the book, articulation of particular issues I encountered as I was writing, fleshing out some of the ideas for the chapters and associated references. Coupled to this, I invited the broader research community to participate in a discussion around some of research issues and questions related to the content of the book as it developed using the Cloudworks site.[7] Cloudworks was also used as a means of adopting an open approach to the literature review associated with the book and aggregation of relevant links and references. The blog posts and Cloudworks provided a rich set of associated resources alongside the book as well as a continued space for ongoing discussion once the book is published. Near-final drafts of the chapters were also posted in dropbox. I will return to my reflections on the process of adopting this open approach in the postscript.

[5] http://cloudworks.ac.uk

[6] http://www.e4innovation.com

[7] http://cloudworks.ac.uk/cloudscape/view/2231

Acknowledgements The ideas described in this book build on an established area of research, which I have been involved with over the past 10 years or so. In particular, it follows on from the development of a learning design toolkit, called DialogPlus,[8] as part of a NSF/JISC-funded project and more recently the OULDI work at the Open University.[9] In particular, I would like to acknowledge the contributions of this work from the following people: Andrew Brasher, Simon Cross, Paul Clark, Juliette Culver, Nick Freear, Richard Lovelace, Rebecca Galley and Paul Mundin. Aspects of the work described here are related to the Design-Practice, OLnet and OPAL projects; it has been a pleasure working with colleagues on these, both across the UK and Europe. I would also like to thank colleagues who provided comments on the draft chapters on Cloudworks and Dropbox. There are too many people to name individually, but at the risk of offending anyone, particular thanks to Alejandro Armellina, Rory Browne, Simos Retalis, Martin Weller and Sandra Wills. Funding for this work is gratefully acknowledged from the JISC/NSF digital libraries programme, OU strategic funding, the JISC Curriculum Design programme and the EU Commission.

Aspects of the work have been published in chapters and journal articles, but this book provides a synthesis of the work to date and provides a clear position/'take' on the field. In addition, it aligns this work alongside related learning design research and more broadly research in closely aligned areas (such as instructional design, the learning sciences, pedagogical patterns and OER research). The aim of the book is to provide a synthesis and coherent overview of learning design as a research area, within an educational context that is technologically rich and increasingly open. The learning design approach described aims to enable teachers to create pedagogically effective learning interventions for their learners, which make innovative and appropriate use of technologies, with the ultimate aim of enhancing the learner experience.

References

Beabout, B. R., Carr-Chellman, A. A., Alkandari, K. A., Almeida, L. C., Gursoy, H. T., Ma, Z., & Pastore, R. (2008). The perceptions of New Orleans educators on the process of rebuilding the New Orleans school system after Katrina. *Journal of Education for Students Placed at Risk, 13*, 212–237.

Beetham, H., & Sharpe, R. (2007). *Rethinking pedagogy for a digital age: Designing and delivering e-learning*. London: Routledge.

Borgeman, C., Abelson, H., Dirks, L., Johnson, R., Koedinger, K., Linn, M., et al. (2008). *Fostering learning in the networked world: The cyberlearning opportunity and challenge* (Report of the NSF Task Force on Cyberlearning). Available online at http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf. Accessed 11 Aug 2011.

Castells, M. (2000). The rise of the networked society. In *The information age: Economy, society and culture* (2nd ed., Vol. 1). Cambridge, MA/Oxford: Blackwell.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hershey: IGI Global.

Conole, G., & Alevizou, P. (2010). *Review of the use(s) of Web 2.0 in Higher Education* (HE Academy commissioned report). Available online at http://www.heacademy.ac.uk/assets/EvidenceNet/Conole_Alevizou_2010.pdf. Accessed 11 Aug 2011.

Conole, G., De Laat, M., Dillon, T., & Darby, J. (2008, February). 'Disruptive technologies', 'pedagogical innovation': What's new? Findings from an in-depth study of students' use and perception of technology. *Computers in Education, 50*(2), 511–524.

Cuban, L. (1986). *Teachers and machines – The classroom use of technology since 1920*. Amsterdam: Teachers Collage Press.

[8] http://www.dialogplus.soton.ac.uk/

[9] http://ouldi.open.ac.uk

Dalziel, J. (2003, December 7–10). *Implementing learning design: The learning activity management system* (LAMS). ASCILITE Conference 2003, Adelaide.

Daniels, H., Cole, M., & Wertsch, J. V. (2007). *The Cambridge companion to Vygotsky*. Cambridge: Cambridge University Press.

De Vaney, A., & Butler, R. P. (1996). Voices of the founders: Early discourses in educational technology. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology*. London: Prentice Hall.

Dewey, J. (1916). *Democracy and education*. New York: Macmillan.

Dewey, J. (1933). *The middle works, 1899–1924, in J. Boydston edited collection*. Carbondale: Southern Illinois University Press, 1976–1983.

Dewey, J. (1938). *Experience and education*. New York: Collier Books.

Dewey, J. (1949). *Experience and existence in Boydston, J. edited collection, John Dewey the later works, 1949–1952* (Vol. 16). Carbondale: Southern Illinois University Press.

Engeström, Y., Punamäki-Gitai, R. L., & Miettinen, R. (1999). *Perspectives on activity theory*. Cambridge: Cambridge University Press.

Giddens, A. (1999). *Runaway world: How globalisation is reshaping our lives*. London: Profile.

Goodfellow, R., & Lea, M. (2007). *Challenging e-learning in the university: A literacies perspective*. Maidenhead/New York: McGraw-Hill/Society for Research into Higher Education, Open University Press.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology, 21*(1), 82–101. Available online at www.ascilite.org.au/ajet/ajet21/goodyear.html. Accessed 27 Jan 2007.

Grasser, A. C., Chipman, P. & King, B. G. (2008). Computer -mediated technologies. In J.M. Spector, M.D. Merrill, J. van Merrienbor and M.P. Driscoll (Eds), Handbook of research on educational communications and technology (3rd ed.) (pp 211-244). New York: Lawrence Erbaun Associates.

Hill, J. R., Hannafin, M. J., & Domizi, D. P. (2005). Resource-based learning and informal learning environments: Prospects and challenges. In L. Tan & R. Subramaniam (Eds.), *E-learning and virtual science centres*. Hershey: Information Science Publishing.

Januszewski, A. (1996). History of educational technology. In *Proceedings of Selected Research and Development Presentations, at the 1996 National Convention of the Association for Educational Communications and Technology*, *18th Annual Conference*, Indianapolis, IN.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Cambridge, MA: MIT Press.

Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century* (MacArthur commissioned report). Available online http://digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF. Accessed 11 Aug 2011.

Jones, C. (2011). Students, the net generation and digital natives: Accounting for educational change. In M. Thomas (Ed.), *Deconstructing digital natives: Young people, technology, and the new literacies*. Abingdon: Routledge.

Kalantzis, M., & Cope, B. (2010). The teacher as designer: Pedagogy in the new media age. *E-Learning and Digital Media, 7*(3), 200–222.

Kennedy, G., Judd, T., Churchward, A., Gray, K., & Krause, K. (2008). First year students' experiences with technology: Are they really digital natives? *Australasian Journal of Educational Technology, 24*(1), 108–122.

Lankshear, C., & Knobel, M. (2006). Digital literacies: Policy, pedagogy and research considerations for education. *Nordic Journal of Digital Literacy, 1*(1), 226.

Laurillard, D., & Ljubojevic, D. (2011). Evaluating learning designs through the formal representation of pedagogical patterns. In C. Kohls & J. Wedekind (Eds.), *Investigations of e-learning patterns: Contextual factors, problems and solutions*. Hershey: IGI Global.

Lockyer, L., Bennett, S., Agostinho, S., & Harper, B. (2008). *Handbook of research on learning design and learning objects*. New York: Information Science Reference.

Mayes, T., & De Freitas, S. (2004). *Review of e-learning frameworks, models and theories*. JISC e-learning models desk study. Available online at http://www.jisc.ac.uk/uploaded_documents/Stage%202%20Learning%20Models%20(Version%201).pdf. Accessed 11 Aug 2011.

Molenda, M. (2008). Historical foundations. In M. J. Spector, M. D. Merrill, J. van Merrienboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (pp. 3–20). Mahwah: Lawrence Erlbaum Associates. Available online at http://www.aect.org/edtech/edition3/ER5849x_C001.fm.pdf. Accessed 11 Aug 2011.

Oblinger, D. G., & Oblinger, J. L. (Eds.). (2005). *Educating the net generation* [Online]. An Educause ebook publication available at http://routes.open.ac.uk/ixbin/hixclient.exe?_IXDB_=routesand_IXSPFX_=gandsubmitbutton=summaryand%24+with+res_id+is+res19283. Accessed 11Aug 2011.

Prensky, M. (2001a). *Digital natives, digital immigrants* (Vol. 9, No. 5). On the Horizon. Lincoln: NCB University Press. Also available online at http://pre2005.flexiblelearning.net.au/projects/resources/Digital_Natives_Digital_Immigrants.pdf. Accessed 11 Aug 2011.

Prensky, M. (2001b). *Digital natives, digital immigrants, Part II: Do they really think differently?* (Vol. 9, No. 6). On the Horizon. Lincoln: NCB University Press. Also available online at http://www.acpinternational-dc.org/articles/digitalnatives2.pdf. Accessed 20 Dec 2010.

Reigeluth, C. M., & Carr-chellman, A. (2009). *Instructional-design theories and models* (Vol. III). New York: Routledge.

Reiser, R. A. (2001). The history of instructional design and technology: Part 1. A history of instructional media. *ETRandD, 49*(1), 53–64.

Rogers, E. M. (1995). *Diffusions of innovation* (4th ed.). New York: The free press.

Segal, D. (2008). Using computer-simulated case-based scenarios to improve learning. *Educause*. Available online at http://www.educause.edu/Resources/UsingComputerSimulatedCaseBase/162765. Accessed 11 Aug 2011.

Sharpe, R., Beetham, H., & De Freitas, S. (2010). *Rethinking learning for the digital age: How learners shape their own experiences*. London: Routledge.

Siemens, G. (2004, October 18). *Categories of e-learning,* blog post. Available online at http://www.elearnspace.org/Articles/elearningcategories.htm. Accessed 11 Aug 2011.

Sims, R. (2005). Beyond instructional design: Making learning design a reality. *Journal of Learning Design, 1*(2), 1–9. Available online at http://www.jld.qut.edu.au/publications/vol1no2/documents/beyond%20instructional%20design.pdf. Accessed 11 Aug 2011.

Spector, M. J. (2008). Theoretical foundations. In M. J. Spector, M. D. Merrill, J. van Merrienboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (pp. 21–27). Mahwah: Lawrence Erlbaum Associates.

Tapscott, D. (1998a). *Growing up digital: The rise of the net generation*. New York: McGraw-Hill.

Tapscott, D. (1998b). *The net generation and the school* [online]. Milken Family Foundation. http://routes.open.ac.uk/ixbin/hixclient.exe?_IXDB_=routes&_IXSPFX_=g&submit-button=summary&%24+with+res_id+is+res19300. Accessed 11 Aug 2011.

Tapscott, D. (1999). Educating the net generation. *Educational Leadership, 56*(5), 6–11.

Tapscott, D. (2008). *Grown up digital: How the net generation is changing your world*. New York: McGraw-Hill.

Tedman, R. A., Alexander, H., & Loudon, R. (2007). Problem-based learning in an e-learning environment – A case study at Griffith University School of Medicine. In L. Jain, R. Tedman, & D. Tedman (Eds.), *Evolution of teaching and learning paradigms in intelligent environment* (pp. 31–46). Heidelberg: Springer.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in society, the development of higher psychological processes*. Oxford: Harvard University Press.

Wills, S., Leight, E., & Ip, A. (2010). *The power of role-based e-learning*. London: Routledge.

Chapter 2
Theory and Methodology: The Interdisciplinary Nature of the Field

Introduction

This chapter will provide an overview of the theoretical perspectives and associated methodologies that underpin learning design. In a discussion of learning technology as a field, Oliver et al. argue that the object of investigation is the knowledge-technology-society nexus (Oliver et al. 2007b). They describe how the study of each of these, knowledge, technology and society, draws on a rich range of research fields across the social sciences, including instructional design, education, philosophy and sociology. Clearly which research fields are drawn on has implications for both the methodologies used and the theoretical perspectives chosen by the researchers. This chapter will locate learning design within the broader field of technology-enhanced learning (TEL)/e-learning. It will draw on the findings of a study which looked at the nature of interdisciplinarity in technology-enhanced learning (TEL) (Conole et al. 2010) and a Networked Learning Conference hot seat on theory and methodology (Conole 2010).

Definitions

Research into the use of technology in an educational context had a long history with changing labels over the years, each indicating evolving trends in the field and emphasising different foci of inquiry (Conole and Oliver 2007, p. 4). Commonly used terms include educational technology, learning technology, e-learning, computer-supported collaborative learning (CSCL), networked learning and, more recently, technology-enhanced learning (TEL).

The focus of this chapter is on theories and methodologies used across these fields. Research on the use of technologies is located within the social sciences research domain and hence draws heavily on epistemologies and methodologies associated with the social sciences. Many books have been written on research methods in social

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_2,

science. The work of Cohen et al. is one of the standard texts for educational research (Cohen et al. 2007). The Research Methods Knowledge Base[1] covers the entire research process including: formulating research questions, sampling, measurement, research design, data analysis and writing research papers. It also addresses the major theoretical and philosophical underpinnings of research including the idea of validity in research and reliability of measures and ethics. The ESRC National Centre for Research Methods[2] provides a comprehensive site for collating research activities across the social sciences, along with the latest in innovations in research methods. Early work carried out by the centre included a review of social science research methods and the generation of a typology of research methods (Beissel-Durrant 2004), which illustrates the rich variety of research methods being used, reflecting the breadth of different epistemological perspectives in the field.

Oliver et al. (2007b) argue that there are a range of different epistemological positions adopted by researchers in the field and that these have implications for how the field is researched. They argue that this is often explained in terms of a 'paradigm debate' and framed as a contrast between qualitative and quantitative methods. They go on to qualify that this is a rather crude distinction; in other words, qualitative data can be interpreted in a positivist way and quantitative data can be used to yield understandings beyond the specific numerical data. They argue that:

> We need to consider how different philosophical positions would interpret the kinds of data generated by particular empirical methods. 'Methodology' describes this relationship, and must be understood separately from 'methods', which are the techniques used to collect and analyse data (This will include things like interviews, questionnaires, observations, etc.) Methodology determines whether the implementation of particular methods is successful or credible. Indeed, according to Agger (2004, p. 77), 'methodologies can't solve intellectual problems but are simply ways of making arguments for what we already know or suspect to be true'.
>
> To do this, methodology codifies beliefs about the world, reflecting 'out there' or 'in here' positions.
>
> The view that knowledge is hard, objective and tangible will demand of researchers an observer role, together with an allegiance to methods of natural science; to see knowledge as personal, subjective and unique, however, imposes on researchers an involvement with their subjects and a rejection of the ways of the natural scientist. To subscribe to the former is to be positivist; to the latter, anti-positivist (Cohen et al. 2007, p. 6).
>
> Such commitments and interests arise from historical, cultural and political influences, which collectively shape traditions of research that provide the context for current work (Conole 2003). These have profound implications for the topics that people study and the kinds of conclusions they are willing to draw (Oliver et al. 2007a, p. 9).

Therefore, methods are the techniques used to collect and analyse data, whereas methodologies align with different epistemological beliefs and views of the world. The term theory is contested and is used in a variety of different ways; below, some of the definitions that are closest to how it is used in an e-learning research context are described.

[1] http://www.socialresearchmethods.net/kb/

[2] http://www.ncrm.ac.uk/

Theory, in the scientific sense of the word, is an analytic structure designed to explain a set of empirical observations. A scientific theory does two things: (1) It identifies this set of distinct observations as a class of phenomena and (2) makes assertions about the underlying reality that brings about or effects this class. In the scientific or empirical tradition, the term theory is reserved for ideas which meet baseline requirements about the kinds of empirical observations made, the methods of classification used and the consistency of the theory in its application amongst members of the class to which it pertains. These requirements vary across different scientific fields of knowledge, but in general, theories are expected to be functional and parsimonious: That is, a theory should be the simplest possible tool that can be used to effectively address the given class of phenomena.[3]

It has also been defined as a 'set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena'.[4] The relationship between theory and empirical data can be defined as follows:

> Social research is theoretical, meaning that much of it is concerned with developing, exploring or testing the theories or ideas that social researchers have about how the world operates. But it is also empirical, meaning that it is based on observations and measurements of reality—on what we perceive of the world around us. You can even think of most research as a blending of these two terms—a comparison of our theories about how the world operates with our observations of its operation.[5]

Researchers' Home Disciplines

One of the 2010 Networked Learning Conference hot seats[6] focused on theory and methodology for networked learning. The hot seat was initiated with a positional paper (Conole 2010), and then a forum was moderated for a month, in January 2010, to discuss aspects of the paper. In parallel, a series of 18 interviews were conducted with key TEL researchers, as part an EPSRC/ESRC the TLRP-commissioned interdisciplinarity study (Conole et al. 2010).

The researchers participating in the hot seat and the TEL researchers interviewed were asked to indicate their home discipline. They cited a broad range of disciplines, including: computer science, education, plant science, veterinary science, ethnology cultural studies, psychology, human-computer interactions (HCI), philosophy, fine art, philosophy, electronic engineering, chemistry, history of art, geology, history and philosophy of science (HPS), linguistics, artificial intelligence, philosophy, sociology, maths and physics. Hence, e-learning researchers bring with them a rich variety of theoretical perspectives and methodologies. In an online discussion on

[3] http://en.wikipedia.org/wiki/Theory

[4] http://www.thefreedictionary.com/theory

[5] http://www.socialresearchmethods.net/kb/naturres.php

[6] http://cloudworks.ac.uk/cloud/view/2881

this topic,[7] it was evident that such diversity brings with it strengths, but it also results in tensions—differences in definitions and understandings and even fundamentally different and often opposing epistemological beliefs.

Firstly, some researchers recognise the underlying influence their home discipline had on their research approach. However, others argued that their perspectives around e-learning have been shaped far more by the experiences they have had working in the area than by prior studies in an unrelated discipline many years ago.

Secondly, the transition to an educational perspective for researchers originally from a science background is hard, requiring a complete rethinking of underlying epistemological beliefs. However, having an understanding of both science and social science perspectives is incredibly useful. Similarly transitional processes are evident from those coming into the research from managerial or business backgrounds.

Thirdly, many researchers are drawn into research into the use of technologies in an educational context from a practical perspective, that is, what can these technologies offer? What are the issues and implications for learning and teaching? This pragmatic stance is coupled with a desire to understand and describe emergent theoretical perspectives.

Finally, irrespective of the theoretical and methodological lenses used to study technological phenomena, it is important to take account of the contextual and in particular the human dimension, within which e-learning takes place.

The Nature of Theory

In the introduction to a special issue of JIME,[8] Oliver provides an overview of the position of theories in the emergent field of learning technologies in 2002 (Oliver 2002):

> I was struck by the diversity of theories that people were drawing upon, and the very different ways in which they were using them. For some, a theory was a touchstone, a guiding set of principles, and the foundation on which their work built. For others, theories were tools, and the important thing was having the right one for the job. What, I wondered, was the right way to use theory here? Should we believe in them, live them, and risk being dogmatic—or should we be pluralistic, tied to none, and risk being superficial?

The papers included in the special issue were very varied. Approaches varied considerably—from theory as tool to theory as principle and from theory building to theory using. So too were the objects of investigation—software tools, logic learning, metadata, multimedia and exploration of issues around the mainstreaming of the use of technologies in education.

Masterman and Manton (2009) considered the role of theory with respect to e-learning posing the following questions: What is the value of theory to teachers? What do we mean by theory? How has theory been embedded? They drew on Lawes' (2004) work and in particular the notion that theory gives a framework for

[7] http://cloudworks.ac.uk/cloud/view/2806

[8] http://jime.open.ac.uk/article/2002-9/95

understanding that ultimately improves the quality of practice and leads to the transformation of subjective experience. They argued that theory could act as the glue between technology and practice. They then went on to make a distinction between theories, models and frameworks:

> Theories provide a means of understanding and predicting something (Cook 2002). In the original article, Cook expands this: 'A theory or model can be used as a means for understanding and predicting some aspect of an educational situation. Theories are not the same as models. A theory can possess an explanatory power and can consist of a set of: …general assumptions and laws … that are not themselves intended to be directly (in)validated (for that, the theory must engender a model). Theories are foundational elements of paradigms, along with shared problems and methods.
>
> Models are abstract representations that help us understand something we cannot see or experience directly (Conole 2007); models include things like Kolb's leaning cycle.
>
> A framework is a structure and vocabulary that supports the explication of concepts and issues (Conole and Oliver 2002), such as Laurillard's Conversational Framework (Laurillard 2002).

They argued that theory is a cornerstone of professional practice and an antidote to technological determinism. However, they also noted that teachers generally do not consciously espouse formal theories and are driven much more by prior experience and reflective practice.

Theoretical Perspectives

This section articulates some of the main theoretical perspectives that are evident in e-learning research. Reviewing the research literature, the following range of theoretical perspectives are evident: social constructivism; actor-network theory; constructivism; critical theory; action research; communities of practice; scientific enquiry; the conversational framework; philosophy of technology; anthropological views on tools, artefacts and technology; and activity theory. A sample of these is discussed below.

Cultural-Historical Activity Theory (CHAT)

Despite the range of theories listed above, arguably sociocultural perspectives are a predominate discourse in the field, in particular, cultural-historical activity theory (CHAT) (Cole and Engeström, 1993; Cole et al. 1997; Daniels et al. 2007; Engeström et al. 1999). A key idea in CHAT is the notion of mediation by artefacts (Kutti 1996; Wertsch 1991), which are broadly defined as including instruments, signs, language and machines (Nardi 1995). As discussed in Chapter 5, Conole (2008) describes the range of mediating artefacts that practitioners can use to support the learning design process. Engeström et al.'s so-called 'triangle'

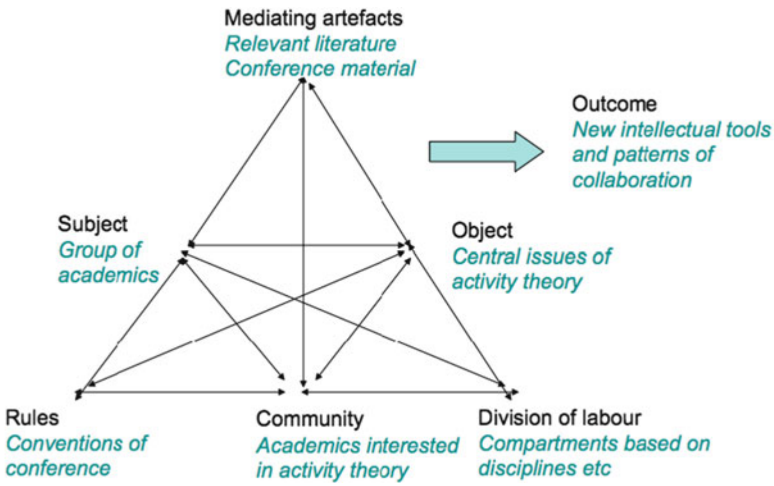

Fig. 2.1 An example of the use of activity theory

representation (Engeström et al. 1999) has been used extensively to describe particular instances of e-learning interventions, as it helps consider a focus on the subject-object relationship and associated outcomes, supported through mediating tools in the context of a wider community context and associated rules and divisions of labour (Joyes 2008; Karasavvidis 2008; Waycott et al. 2005).

Figure 2.1 shows Engeström et al.'s frequently used triangle representation of an activity system. In this case, the focus is on a group of academics (the subject) with the object of developing a better understanding of activity theory (AT) and how it can be used. The mediating artefacts they use are relevant research literature and conference material. The rules are bounded by the practices within the conference setting. The community consists of academics interested in AT. The division of labour is based on discipline lines. Finally, the outcomes are new intellectual tools and patterns of collaboration and a better understanding of AT.

Communities of Practice

Wenger's theory of communities of practice (CoP) is valuable as it considers the ways in which communities of practice are formed and developed. He sees four main aspects: learning as community, learning as identity, learning as meaning and learning as practice (Fig. 2.2). Therefore, each is valuable in that it helps to foreground particular aspects of learning, which can then be used to provide guidance. This is very much an example of a socially situated theory of learning where learning is seen as social participation.

Wenger's notion of communities of practice (Wenger 1998) has been picked up and used extensively in the field of e-learning (Breuleux et al. 1998; Cousin and

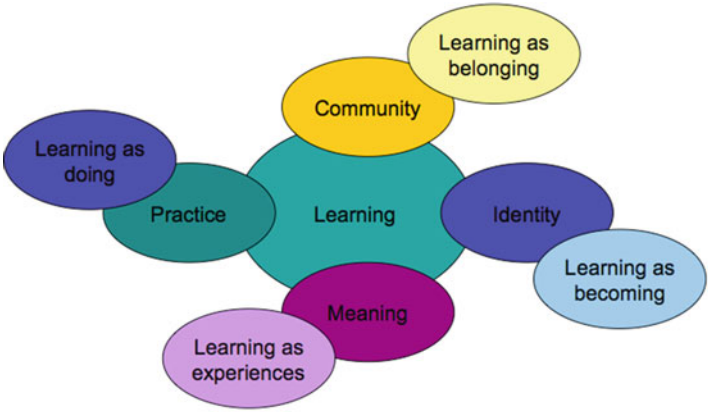

Fig. 2.2 The components of a community of practice

Deepwell 2005; Guldberg and Pilkington 2006).[9] Its appeal is probably a combination of the fact that it is a relatively easy concept to grasp and that it offers a means of explaining some of the more socially situated interactions arising in e-learning. Gannon-Leary and Fontainha (2007) use CoP as a means of considering the benefits, barriers and successes of creating virtual communities. I will return to a more detailed discussion of the nature of online communities in Chapter 14.

Actor-Network Theory

Developed by Callon and Latour (Callon 1999; Callon and Latour 1981; Latour 2005), actor-network theory (ANT) considers both people and technologies as 'actants' in a connected network, emphasising that it is the relationship between these actants that is important. Although called a theory, it does not explain a phenomenon but focuses more on why a network takes the form that it does. It is much more interested in exploring how actor networks get formed, hold themselves together or fall apart. It maps the relationships between material (between things) and semiotic (between concepts), assuming that many relations are both material and semiotic and that together they form a network.

Hustad and Bechina (2010) use ANT as an analytic framework to understand the use of Web 2.0 technologies. They argue that ANT helps to interpret the design and implementation process for socio-technical systems, adding that an ANT perspective is useful in providing an understanding of all the connections and influences involved. It also reveals conflicts, power relations, learning processes and the nature of the network.

[9] See, for example, this collection of resources http://archive.e-learningcentre.co.uk/eclipse/Resources/communities.htm

Cybernetics and Systems Thinking

Cybernetics and systems thinking provide a means of understanding complex systems (Capra 1996; Gharajedaghi 1999) and have been applied to a limited extent in an e-learning context. Liber (2004), for example, draws on the work of Illich and Beer as a means of describing modern learning environments and systems (Beer 1959; Illich 1973). Related work, which also applies systems thinking, includes the work of Friesen (2004), Stankov et al. (2004), and Cantoni et al. (2004).

Methodological Approaches

This section describes some of the key methodological approaches used in e-learning. The choice of methodology tends to reflect both the individual's epistemological stance and their focus of inquiry. Oliver et al. (2007b) argue that the kinds of data that are available to e-learning researchers may suggest particular kinds of interpretation. This hints at the suggestion that there is a complex interrelationship between research in the field and the affordances[10] of the technologies themselves.

It is not possible to provide a comprehensive review of all the different methodological approaches used in e-learning. Methodologies are predominantly interpretive in nature, although experimental approaches are still used extensively in North America. In terms of methods, a range are evident: interviews, focus groups, observations, surveys, student journals, video and audio diaries, document analysis and Web tracking. In-depth case studies are popular, as are large-scale surveys. The use of learning analytics and Web tracking as a means of data collection is still in its infancy, but is a growing area of research; indeed, the first international conference on learning analytics was held in 2011 in Banff.[11] The site provides the following working definition:

> Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs.

Given the increasing range of ways in which data can be collected on how learners interact online, it is likely that learning analytics will become an increasing focus of attention and research in the coming years.

Content Analysis

Early research in the field was dominated by analysis of asynchronous discussion forums (Mason and Kaye 1989). Coding schemes, such as those developed by Henri

[10] See Chapter 6 for a more detailed discussion of this term.

[11] https://tekri.athabascau.ca/analytics/

(1992) and Gunawardena et al. (1997) were used extensively. Henri identified the following five dimensions that can be used to evaluate computer-mediated conferences: participative, social, interactive, cognitive and metacognitive. Garrison et al. (2000) developed a 'community of learning' model, which assumes that learning occurs through the interaction of three core components: cognitive presence, teaching presence and social presence (Arbaugh et al. 2008; Garrison et al. 2000). Gunawardena et al. divided content into the types of cognitive activities the participants engaged with (questioning, clarifying, negotiating, synthesising, etc.), the types of arguments they put forward, the resources used and any evidence of changes in understanding (Gunawardena et al. 1997).

In this early work, arguably there was a naïve assumption that focusing on the content in the treaded messages was enough to capture the whole event, whereas in reality, the level of detail and the object of focus will naturally have a significant impact on results and it was soon realised that taking account of the broader context within which discussion forums were taken place was important. Jones, for example, reports students simulating collaboration online, whilst actually being co-present seated around four computers (Jones 1999). A number of approaches have been used to take account of the broader perspective. For example, De Laat et al. use a multi-method approach using social network analysis (SNA) with content analysis and critical event recall (De Laat 2006; De Laat et al. 2006, 2007). In this work, they used social network analysis (Hawthornthwaite 2002) to visualise the social structures and dynamics of the course; content analysis is used to identify the learning and teaching processes and critical event recall to elicit teachers' experiences and perceptions.

Ethnography

Ethnography has been used extensively in e-learning (Hodgson and Watland 2004; Kruger 2006; Rice-Lively 1994). The approach is qualitative by based on the 'systematic description of human behaviour and organisational culture based on first-hand observation' (Howard 2002). Data collection is often through a mixture of participant observations, interviews, questionnaires and focus groups. It aims to describe the nature of those who are studied in real-world contexts (LeCompte et al. 1993).

In terms of investigating the use of online interactions and communities, virtual ethnography has emerged as an important subset of ethnography (Hine 2000). Kruger (2006) describes how she used virtual ethnography to study a group of students in a blended online learning context. She found that the online environment enhanced the level of active participation, (subjective) self-evaluation and deeper processes of learning. She concluded as a result that e-learning can promote and enhance independence and individuality through an increased self-responsibility for learners' own learning.

Case Studies

Rich, situated case studies are a popular and common form of studying e-learning. A case study is an in-depth investigation or study of a single individual, group, incident or community (Yin 2009). The nature and scope of the cases can vary significantly, and the approach often overlaps with other methodological approaches (such as action research, evaluation and ethnography). Critics of the case study approach argue that the findings are not generalisable or transferable. Proponents argue that the case-based approach enables the researcher to gather a rich, contextual understanding of a situation in context.

Action Research

As might be expected, given the educational nature of e-learning as a research field, action research is often used as a methodological approach, particularly by practitioners who are trialling out the use of technologies in their classroom and who want a framework within which to study the interventions (Derntl and Motschnig-Pitrik 2004; Garrison 2003; Sloman 2001).

Evaluation

The importance of evaluation has grown in recent years; as new learning technologies emerge, there is a need to evaluate how these are used to support an increasingly diverse student population. The relationship between evaluation and research more generally remains contested. Both processes may use the same methods and study the same things. However, one way to distinguish them is to consider how findings are used. If they are interpreted by an immediate, local audience and used to support decision-making, the study was probably an evaluation; if findings are interpreted in terms of theories and are presented as a contribution to knowledge, it was probably research. Oliver et al. contend that approaches in evaluation range from positivist approaches, focused upon objective data collection (typically using quantitative methods), to interpretivist ones more rooted in constructivism (typically using qualitative methodologies) (Oliver et al. 2007b).

Choosing an Appropriate Methodology

So which methodology should be used when, and are some methodologies better than others? Oliver et al. consider how four different methodological approaches (action research, behaviourist, activity theory based and a perspective based on power) are

Table 2.1 Theoretical perspectives influencing the field

Theoretical perspective	Authors
Sociocultural approaches	Vygotsky (1978)
Activity theory	Engeström et al. (1999)
	Engeström (2001)
Design-based research	Collins (1992)
Utilisation-focused evaluation	Patton (2008)
Cultural psychology	Lave and Wenger (1991)
Artificial intelligence	Boden (1989)
Communities of practice	Lave and Wenger (1991, 1998)
Interdisciplinarity	Blackwell et al. (2009)
Multiple intelligences	Gardener (1993)
Mediating artefacts	Wertsch (1991)

used to tackle the same research problem (Oliver et al. 2007a). This provides a nice illustration of how different theoretical perspectives would explain this situation differently and how each can contribute to our understanding of this field.

Influences, Beliefs and Theoretical Perspectives

Analysis of the discussion on the Networked Learning hot seat and the interviews with the 18 TEL researchers indicates that researchers in the area are drawing on a broad group of influential thinkers. However, it is also evident that there does appear to be a common shared discourse underpinning the field. Sociocultural approaches—in particular the work of Vygotsky (1978) and others around activity theory—seem to be particularly influential. Table 2.1 lists some of the key theoretical perspectives that these researchers are drawing on.

Similarly, Table 2.2 lists some of the key texts that are drawn on extensively. These individuals and texts give a flavour of what is shaping the field and the broader literature that is being drawn on. It demonstrates that the field is indeed interdisciplinary, because these texts are drawn from a broader set of disciplines than research that can be purely labelled TEL research. However, there is an additional important aspect to the nature of interdisciplinarity in TEL research, both in terms of the actual processes involved and how individuals react with and benefit from other researchers.

Interdisciplinarity and TEL Research

This chapter has considered the nature of theory and methodology in TEL research. It has described the range of feeder disciplines and associated approaches as well as articulating some of the key research perspectives that TEL researchers draw on. Conole et al. (2010) suggest that e-learning is by nature an interdisciplinary field and make the following observations.

Table 2.2 Key texts

Text	Authors
Educating the Reflective Practitioner	Schön (1987)
Academic Tribes and Territories: Intellectual Enquiry and the Cultures of Discipline	Becher and Trowler (2001)
Distributed Cognition	Salomon (1993)
Rethinking University Teaching	Laurillard (2002)
Plans and Situated Actions: The Problem of Human-Machine Communication	Suchman (1987)
A Dynamic Medium for Creative Thought	Kay (1972)
Doing Research/Reading Research Re-interrogating Education	Dowling and Brown (2010)
Common and Border Lands	Strathern (2004)

The Cultural Nature of Human Development Rogoff (2003)

Firstly, as a relatively new field, TEL research has attracted people from different disciplines, each bringing with them different theoretical and methodological perspectives.[12]

Secondly, TEL research by its nature is complex and is concerned with improving education through the use of technology. It therefore needs to draw both on subject areas concerned with learning and teaching (education, psychology, etc.) and those concerned with technology (computer sciences, information sciences, etc.), as well as understanding the local nuances and cultural differences across different subject domains. Bringing these different aspects together effectively is a key challenge for TEL research, and therefore, it needs the different interdisciplinary perspectives to understand it; that is, interdisciplinarity is a core facet of TEL research. If TEL research is going to work, it has to be interdisciplinary, and people need to bring a wide range of different skills, perspectives and research tools to bear upon a particular problem.

Thirdly, there are huge and interesting cognitive, technical and social questions surrounding the delivery of technology-enhanced learning. For example: How should the cognitive and social be integrated? How should knowledge be organised? How should learning interventions be orchestrated and managed? These are highly complex questions and need more technical resources than other areas of educational research. Evaluation of the educational products or artefacts produced then needs to adopt an interdisciplinary approach.

Fourthly, a number of strategies need to be in place to support TEL research practices. Researchers need help to develop the skills needed to undertake interdisciplinary research. Institutions need to have in place appropriate career paths to foster and promote interdisciplinarity. This has not always been the case, and some TEL researchers have found that they reach a ceiling in their institution in terms of promotion, having to either revert to more traditional roles or move into managerial positions. Some felt that often the value of TEL research groups in terms of institutional support remains to be fully exploited and that interdisciplinary research

[12] See also Conole and Oliver (2007, pp. 1–15).

groups could play a more proactive role within institutions, helping them make strategic decisions on the effective use of technologies to support learning and teaching. It seems that TEL research groups often find themselves outside of formal institutional decision-making mechanisms.

Fifthly, some tensions are evident between the disciplines. TEL research has to meet the research agenda of the disciplines involved and, in particular, the needs of both computer scientists and educationalists, arguably two of the core disciplines underpinning e-learning.

Conclusion

It is evident that TEL is interdisciplinary in nature, drawing on a broad range of theories and methodologies. TEL research is an inherently mode 2 research field (Gibbons et al. 1994),[13] that is, it is applied. Gibbons et al. (1994) argued that a new form of knowledge production started emerging from the mid-twentieth century which is context driven, problem focused and interdisciplinary. It involves multidisciplinary teams brought together for short periods of time to work on specific problems in the real world. They distinguished this from traditional (mode 1) research; Limoges clarified this (1996, pp. 4–15):

> We now speak of 'context-driven' research, meaning 'research carried out in a context of application, arising from the very work of problem solving and not governed by the paradigms of traditional disciplines of knowledge.

In the context of TEL research, this is about investigating the role of technologies in education and testing out and evaluating new learning interventions. Although still a relatively young field, as this chapter has indicated, there is an emerging underpinning theoretical basis for the field. Nonetheless, we need to continue to ensure that the research is theoretical based and work towards developing a clearer set of theories to describe our research findings.

References

Agger, B. (2004). *The virtual self: A contemporary sociology*. Oxford: Blackwell.

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., et al. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3–4), 1330136.

Becher, T., & Trowler, P. R. (2001). *Academic tribes and territories: Intellectual enquiry and the cultures of disciplines* (2nd ed.). Buckingham: Open University Press/SRHE.

Beer, S. (1959). *Cybernetics*. Cambridge, MA: MIT Press.

[13] Mode 2 is a concept used to describe a new way of scientific know production. It is socially distributed, application orientated and trans-disciplinary.

Beissel-Durrant, G. (2004). *A typology of research methods within the social sciences*. ESRC NCRM commissioned paper. Available online at http://eprints.ncrm.ac.uk/115/1/NCRMResearchMethodsTypology.pdf. Accessed 11 Aug 2011.

Blackwell, A. F., Wilson, L., Street, A., Boulton, C., & Knell, J. (2009). *Radical innovation: Crossing knowledge boundaries within interdisciplinary teams, no. 760*. Cambridge: University of Cambridge Computer Laboratory.

Boden, M. (1989). *Artificial intelligence in psychology*. Cambridge, MA: MIT Press.

Breuleux, A., Laferrière, T., & Bracewell, R. J. (1998, August 18–21). Networked learning communities in teacher education. In *Proceedings of SITE* (Vol. 98). Ninth International Conference, Washington, DC.

Callon, M. (1999). Actor-network theory: The market test. In J. Law & J. Hassard (Eds.), *Actor network and after* (pp. 181–195). Oxford/Keele: Blackwell/Sociological Review.

Callon, M., & Latour, B. (1981). Unscrewing the big Leviathan: How actors macro-structure reality and how sociologists help them to do so. In K. Knorr-Cetina & A. V. Cicourel (Eds.), *Advances in social theory and methodology: Toward an integration of micro- and macro-sociologies* (pp. 277–303). Boston: Routledge/Kegan Paul.

Cantoni, V., Cellario, M., & Porta, M. (2004). Perspectives and challenges in e-learning: Towards natural interaction paradigms. *Journal of Visual Languages and Computing, 15*(5), 333–345.

Capra, F. (1996). *The web of life*. New York: Anchor books.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education*. London: Routledge.

Cole, M., & Engeström, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed cognition – Psychological and educational considerations*. Cambridge: Cambridge University Press.

Cole, M., Engeström, Y., & Vasquez, O. A. (1997). *Mind, culture and activity: Seminal papers from the laboratory of comparative human cognition*. Cambridge: Cambridge University Press.

Collins, A. (1992). Towards a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in educational technology* (pp. 15–22). New York: Springer.

Conole, G. (2003). *Research questions and methodological issues* (HEFCE E-learning Research Centre Report). Southampton: University of Southampton.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hershey: IGI Global.

Conole, G. (2010). *Theory and methodology in networked learning*. Paper presented at the Networked Learning Conference Hotseat. Available online at http://cloudworks.ac.uk/cloud/view/2881. Accessed 11 Aug 2011.

Conole, G., & Oliver, M. (2002). Embedding theory into learning technology practice with toolkits. *Journal of Interactive Educational Media, 8*, 1–28. Available online at http://jime.open.ac.uk/jime/article/viewArticle/2002-8/93. Accessed 11 Aug 2011.

Conole, G., & Oliver, M. (2007). Introduction, 1–15. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research*. London: RoutledgeFalmer.

Conole, G., Oliver, M., Falconer, I., Littlejohn, A., & Harvey, J. (2007). Designing for learning. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Themes, methods and impact on practice* (Part of the F. Lockwood (ed.), *Open and distance learning series*). London: RoutledgeFalmer.

Conole, G., Scanlon, E., Mundin, P., & Farrow, R. (2010). *Technology enhanced learning as a site for interdisciplinary research*. Full report available online http://cloudworks.ac.uk/cloud/view/3419 and TLRP TEL briefing paper available online at http://www.tlrp.org/docs/TELInterdisciplinarity.pdf. Accessed 11 Aug 2011.

Cook, J. (2002). The role of dialogue in computer-based learning and observing learning: An evolutionary approach to theory. *Journal of Interactive Multimedia Education, 5*. Available online at http://www-jime.open.ac.uk/2002/5/. Accessed 11 Aug 2011.

Cousin, G., & Deepwell, F. (2005). Designs for network learning: A communities of practice perspective. *Studies in Higher Education, 30*(1), 57–66.

Daniels, H., Cole, M., & Wertsch, J. V. (2007). *The Cambridge companion to Vygotsky*. Cambridge: Cambridge University Press.

De Laat, M. F. (2006). *Networked learning*. Ph.D. thesis. University of Utrecht: Apeldoorn.

De Laat, M. F., Lally, V., Lipponen, L., & Simons, P. R. J. (2006). Analysing student engagement with learning and tutoring activities in networked learning communities: A multi-method approach. *International Journal of Web-Based Communities, 2*(4), 394–412.

De Laat, M., Lally, V., Lipponen, L., & Simons, P. (2007). Online teaching in networked learning communities: A multi-method approach to studying the role of the teacher. *Instructional Science, 35*(3), 257–286.

Derntl, M., & Motschnig-Pitrik, R. (2004, April 5–7). *A pattern approach to person-centered e-learning based on theory-guided action research*. Paper presented at the Networked Learning Conference, Lancaster University.

Dowling, P., & Brown, A. (2010). *Doing research/reading research: Re-interrogating education* (2nd ed.). London/New York: Routledge.

Engeström, Y. (2001). Expansive learning at work: Toward an activity-theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133–156.

Engeström, Y., Punamäki-Gitai, R. L., & Miettinen, R. (1999). *Perspectives on activity theory*. Cambridge: Cambridge University Press.

Friesen, N. (2004). Three objections to learning objects and e-learning standards. In R. McGreal (Ed.), *Online education using learning objects* (pp. 59–70). London: RoutledgeFalmer.

Gannon-Leary, P., & Fontainha, E. (2007). Communities of practice and virtual learning communities: Benefits, barriers and successes. *eLearning Papers*, *No. 5*. Available online at http://www.elearningeuropa.info/files/media/media13563.pdf. Accessed 11 Aug 2011.

Gardener, H. (1993). *Frames of mind: The theory of multiple intelligences* (2nd ed.). London: Fontana Press.

Garrison, D. R. (2003). *E-learning in the 21st century: A framework for research and practice*. London: Routledge.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105.

Gharajedaghi, J. (1999). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Boston: Butterworth-Heinemann.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. London: Sage.

Guldberg, K., & Pilkington, R. (2006). A community of practice approach to the development of non-traditional learners through networked learning. *Journal of Computer Assisted Learning, 22*(3), 159–171.

Gunawardena, C. N., Lowe, C. A., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research, 17*(4), 397–431.

Hawthornthwaite, C. (2002). Building social networks via computer networks: Creating and sustaining distributed learning communities. In K. A. Renninger & W. Shumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 159–190). Cambridge: Cambridge University Press.

Henri, F. (1992). Computer conferencing and content analysis. In A. R. Kaye (Ed.), *Collaborative learning through computer conferencing: The Najaden papers* (pp. 116–136). Berlin: Springer.

Hine, C. (2000). *Virtual ethnography*. London: Sage. Available online at http://labweb.education.wisc.edu/steinkuehler/curric606/readings/Hine2000a.pdf. Accessed 11 Aug 2011

Hodgson, V., & Watland, P. (2004). Researching networked management learning. *Management Learning, 35*(2), 99–116.

Howard, P. N. (2002). Network ethnography and the hypermedia organization: New media, new organizations, new methods. *New Media and Society, 4*(4), 550–574.

Hustad, E., & Bechina, A. A. (2010, December 16–17). *From classroom learning to e-learning: An actor network perspective*. The seventh international conference on E-learning for Knowledge-Based Society, Bangkok. Available online at http://www.elearningap.com/eLAP2010/Proceedings/07_Full_Eli%20Hustad_From%20Classroom%20Learning%20to%20E-learning.pdf. Accessed 11 Aug 2011.

Illich, I. (1973). *Tools for conviviality*. London: Calder and Boyars.

Jones, C. R. (1999). From the sage on the stage to what exactly? Description and the place of the moderator in cooperative and collaborative learning. *ALT-J, 7*(2), 27–36.

Joyes, G. (2008). An activity theory approach to researching tutors' perceptions of effective online pedagogy. *Educational Media International, 45*(3), 231–243.

Karasavvidis, I. (2008, May 5–6). Activity theory as a theoretical framework for the study of blended learning: A case study. In *Proceedings of the Networked Learning conference*, Halkidiki, Greece. Available online at http://www.networkedlearningconference.org.uk/past/nlc2008/abstracts/Karasavvidis.htm. Accessed 11 Aug 2011.

Kay, A. C. (1972, November 23–25). *A dynamic medium for creative thought*. Paper presented at the The National Council of Teachers of English, Minneapolis, Minnesota.

Kruger, S. (2006, April 10–12). Students' experiences of e-learning: A virtual ethnography into blended online learning. In *Proceedings of the Networked Learning conference*, Lancaster University.

Kutti, K. (1996). Activity theory as potential framework for human computer interaction research. In B. Nardi (Ed.), *Context and consciousness: Activity and human-computer interaction*. London: MIT Press.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford: Oxford University Press.

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.). London: RoutledgeFalmer.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lave, J., & Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.

Lawes, S. (2004). Practice makes imperfect. In D. Hayes (Ed.), *The RoutledgeFalmer guide to key debates in education* (pp. 197–201). London: RoutledgeFalmer.

LeCompte, M. D., Preissle, J., & Tesch, R. (1993). *Ethnography and qualitative design in educational research* (2nd ed.). San Diego: Academic.

Liber, O. (2004). Cybernetics, e-learning and the education system. *International Journal of Learning Technology, 1*(1), 127–140.

Limoges, C. (1996). *L'université à la croisée des chemins: une mission à affirmer, une gestion à réformer*. Quebec: Actes du colloque ACFAS.CSE.CST, Gouvernement du Québec Ministère de l'Éducation.

Mason, R., & Kaye, A. (1989). *Mindweave: Communication, computers and distance education*. Oxford: Pergamon.

Masterman, L., & Manton, M. (2009, March 23–25). Pedagogic theory and pedagogic planning in digital worlds. In *Proceedings of the CAL Conference – Technology and Creativity*, Brighton.

Nardi, B. (1995). *Context and consciousness: Activity and human-computer interaction*. London: MIT Press.

Oliver, M. (2002). JISM special issue on theory for learning technologies: Editorial. *Journal of Interactive Multimedia Education, 9*. Available online at http://jime.open.ac.uk/article/2002-9/95. Accessed 11 Aug 2011.

Oliver, M., Roberts, G., Beetham, H., Ingraham, B., Dyke, M., & Levy, P. (2007a). Knowledge, society and perspectives on learning technology. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Themes, methods and impact on practice* (pp. 21–37). London: RoutledgeFalmer.

Oliver, M., Harvey, J., Conole, G., & Jones, A. (2007b). Evaluation. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Themes, methods and impact on practice* (pp. 203–216). London: RoutledgeFalmer.

Patton, M. Q. (2008). *Utilization focused evaluation*. Saint Paul: Sage.

Rice-Lively, M. L. (1994). Wired warp and woof: An ethnographic study of a networking class. *Internet Research, 4*(4), 20–35. http://www.emeraldinsight.com/10.1108/10662249410798920. Accessed 11 Aug 2011.

Rogoff, B. (2003). *The cultural nature of human development*. New York: Oxford University Press.

Salomon, G. (Ed.). (1993). *Distributed cognitions – Psychological and educational considerations*. Cambridge: Cambridge University Press.

Schön, D. A. (1987). *Educating the reflective practitioners: Towards a new design for teaching and learning within the professions*. San Francisco: Joey-Bass Inc.

Sloman, M. (2001). *The e-learning revolution: From propositions to action London: Chartered Institute of Personnel and Development*. London: CIPD.

Stankov, S., Grubišić, A., & Žitko, B. (2004). E-learning paradigm and intelligent tutoring systems. In *Annual 2004 of the Croatian Academy of Engineering* (pp. 21–31).

Strathern, M. (2004). *Commons and borderlands: Working papers on interdisciplinarity, accountability and the flow of knowledge*. Wantage: Sean Kingston Publishing.

Suchman, L. A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.

Vygotsky, L. S. (1978). *Mind in society, the development of higher psychological processes*. Oxford: Harvard University Press.

Waycott, J., Jones, A., & Scanlon, E. (2005). An activity theory framework for analysing PDAs as lifelong learning tools. *Special Issue of Learning Media and Technology, 30*(2), 107–130.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity* (Learning in doing: Social, cognitive, and computational perspectives). Cambridge: Cambridge University Press.

Wertsch, J. V. (1991). *Voices of the mind. A sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Yin, R. K. (2009). *Case study research: Design and methods*. London: Sage.

Chapter 3
Related Research Fields

Introduction

This chapter describes a number of research fields that are closely related to learning design and discusses how they have been used as a means of promoting more effective teaching practices. The chapter looks explicitly at the ways in which learning and teaching innovations have been promoted and supported. It considers the strategies that have been used to scaffold teaching practice to ensure effective use of good pedagogy and to promote innovative use of new technologies. Whilst not intending to be exhaustive, it aims to give a flavour and overview of some of the approaches.

It is important to note that the learning design methodology, introduced in this book, does not seek to replace these existing approaches, but instead intends to draw on them using a theoretical framework which focuses on the mediating artefacts[1] used in learning and teaching (Conole 2008). Learning design is intended to be a holistic approach, covering all stakeholders involved in the learning and teaching process. The approaches to supporting teacher practice discussed in this chapter are instructional design, the learning sciences, learning objects and open educational resources, pedagogical patterns, and professional networks and support centres.

Instructional Design

Learning design is closely aligned to, but distinct from, the well-established field of instructional design. Hohanson et al. (2008, p. 6) argue that instructional design is guided by a range of theories, ideas, beliefs and assumptions, not least the perception of the practitioners' own practice. Goodyear and Retalis position instructional design as a 'rational, technical enterprise, concerned with optimizing learning and

[1] This is discussed in Chapter 6.

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_3,

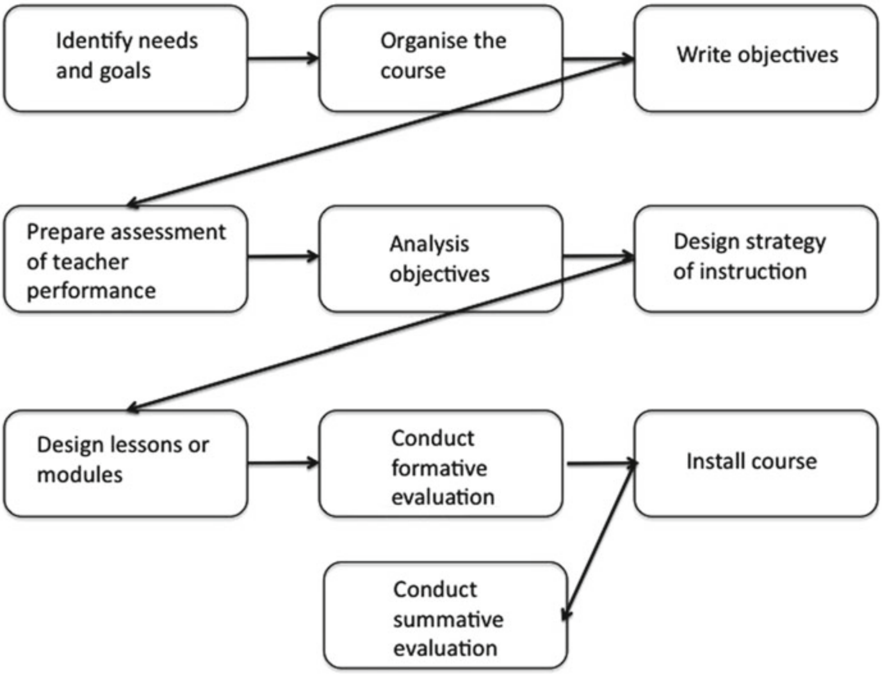

Fig. 3.1 A visual representation of Gustafson and Tillman's instructional design model

instruction through the application of objective scientific principles' (Goodyear and Retalis 2010, p. 18).

Gustafson and Tillman argue that instructional design as an approach is useful because of the belief that use of systematic design procedures can make instruction more effective and efficient (Gustafson and Tillman 1991, p. 3). They describe a general instructional design model as consisting of ten stages (Fig. 3.1).

Reigeluth argues that:

> Instructional Design is concerned with understanding, improving, and applying methods of instruction. It is the process of deciding what methods of instruction are best for bringing about desired changes in student knowledge and skills for a specific course content and a specific student population. The result of instructional design is an 'architect's blueprint; for what the instruction should be like. This blueprint is a prescription as to what methods of instruction should be used when for what course content and which students. (Reigeluth 1983, p. 7)

Within this context, Reigeluth and Carr-Chellman define instruction as anything that is done purposely to facilitate learning (Reigeluth and Carr-Chellman 2009, p. 6). Instructional design has a long history as an approach to systematically designing learning interventions. It has been defined as:

> The process by which instruction is improved through the analysis of learning needs and systematic development of learning materials. Instructional designers often use technology and multimedia as tools to enhance instruction. (Design n.d.)

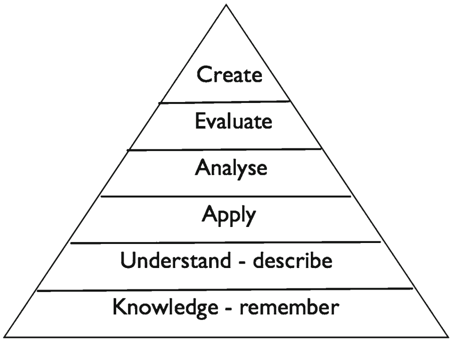

Fig. 3.2 Categories of the cognitive educational objectives

Reiser (2001) defines instructional design as encompassing:

> The analysis of learning and performance problems, and the design, development, implementation, evaluation and management of instructional and non-instructional processes and resources intended to improve learning and performance in a variety of settings. (Reisers 2001, p. 53)

Reiser identifies two practices that form the core of the field: (1) the use of media for instructional purposes and (2) the use of systematic instructional design processes (Reiser 2001).

Instructional designers design instructions to meet learning needs for a particular audience and setting. Learning design, in contrast, as described in this book, takes a much broader perspective and sees design as a dynamic process, which is ongoing and inclusive, taking account of all stakeholders involved in the learning-teaching process. Instructional design tends to focus more on the designers as producers and learners as consumer. A number of key features characterise or help define instructional design as an approach.

Van Merrienboer and Boot (2005, p. 46) describe instructional design as an analytical pedagogical approach. This includes the development and evaluation of learning objectives. A key milestone, in this respect, was Bloom's taxonomy of educational objectives (Bloom 1956). This was later expanded on by Anderson and Krathwohl (2001). Bloom's taxonomy was divided into three aspects: cognitive (knowing, comprehension, application, analysis, synthesis and evaluation), affective (receiving, responding, valuing, organising and characterising) and psychomotor. In terms of the six cognitive objectives, these were intentionally seen as representing higher-order thinking, from knowledge through to evaluation. Anderson and Krathwohl (2001) revised the categorisations and included 'create' as the highest level educational objective (Fig. 3.2).

In 1965, Gagné (1965) published his conditions of learning, describing five domains of learning outcomes (verbal information, intellectual skills, psychomotor skills, attitudes and cognitive strategies). He argued that each required a different set of conditions to promote learning. He also described nine events of instruction or teaching activities needed to support the attainment of the different learning outcomes, namely: gaining attention, informing learners of the objectives, stimulating recall of prior learning, presenting the stimulus, providing learner guidance, eliciting performance, providing feedback, assessing performance and enhancing retention and transfer. These were based on four principles (Gagné 1985), namely: that (1) different instruction is required for different learning outcomes, (2) events of learning operate on the learner in ways that constitute the conditions of learning, (3) specific operations that constitute instructional events are different for each different type of learning outcome and (4) learning hierarchies define what intellectual skills are to be learned and a sequence of instruction.

At the heart of the early instructional design work were three aspects: task analysis, objective specification and criterion-referenced testing. Since this early work, instructional design has developed into a significant field, and numerous instructional design models have been produced and evaluated. It is now a recognised professional discipline, with established masters-level courses providing a foundation on the fundamentals of the field. Instructional design as an approach seeks to identify learning goals and through analysis of these goals deriving instructional methods to achieve them. This involves the development of a set of rules for employing instructional strategies to teach different content in different settings, with the rule set linking to conditions, instructional methods and learning outcomes. Instructional design is also, in essence, a systems approach to instruction and instructional development, that is, thinking systemically about instruction and seeing teachers, learners, content, etc., as components of a larger system. In recent years, work in instructional design has shifted to attempt to take a more explicit account of constructivist and socially situated approaches to learning, although its origin in behaviourist approaches is still evident.

Of particular note in the field is the work of Merrill, who through a review and analysis of instructional design theories and methods devised a set of first principles for design (Merrill 2002; Merrill 2009, p. 43), namely, that learning is promoted when learners are engaged in a range of ways. The central focus is on the tasks that learners do through activation, demonstration, application and integration (Fig. 3.3). A principle is defined as a relationship that is always true under appropriate conditions regardless of the methods or models, which implement the principle. Merrill's five principles are:

1. Demonstration principle: Learning is promoted when learners observe a demonstration.
2. Application principle: Learning is promoted when learners apply the new knowledge.
3. Task-centred principle: Learning is promoted when learners engage in a task-centred instructional strategy.
4. Activation principle: Learning is promoted when learners activate relevant prior knowledge or experience.
5. Integration principle: Learning is promoted when learners integrate their new knowledge into their everyday world.

The principles were an attempt to identify the fundamental principles of good instructional design. They have been extensively quoted, and many of the models that have been subsequently developed explicitly map to them.

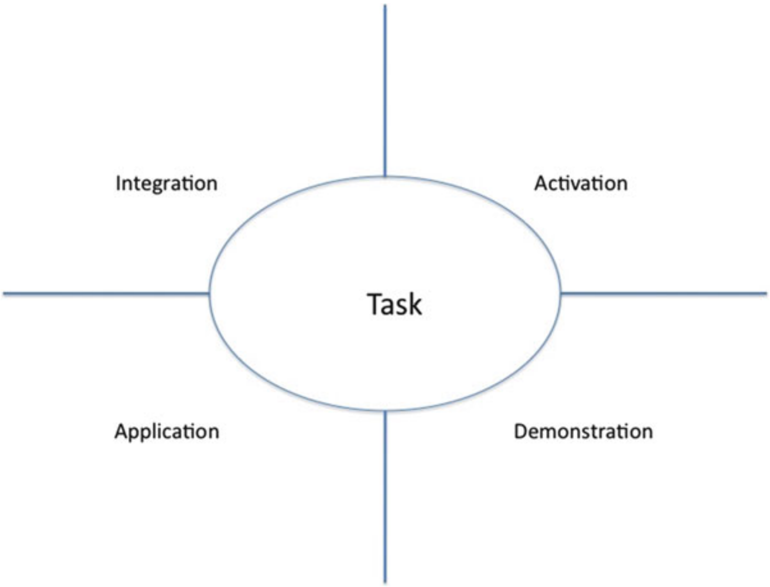

Fig. 3.3 Merrill's five principles of instructional design

The Learning Sciences

The learning sciences is an interdisciplinary field that emerged in the mid-1990s (Sawyer 2006). It draws on a number of related fields, including: cognitive science, educational psychology, computer science, anthropology, sociology, neuroscience and other fields. It developed in part as a backlash against traditional notions of education, focusing on instructionism (Papert 1993 cited in Sawyer 2006) as the principle paradigm, namely, that learning is about acquiring knowledge which consists of a collection of facts and procedures. Sutcliffe (2003, p. 242) defines instructionism as 'learning by telling and emphasises delivery of content; in contrast, constructionist approaches emphasise learning by doing'. New research on learning suggested that this narrow perspective of learning was incorrect and that there was a need to take account of a number of additional factors: the importance of deep conceptual understanding, a focus on learning rather than just teaching, the creation of appropriate learning environments to foster learning, the need to build on prior learning and the importance of reflection (Bransford et al. 2000).

Therefore, in contrast to instructional design, the foundations of the learning sciences are constructivism and cognitive sciences. The majority of the work focused on school-based learning. Sawyer (2006) provides a useful edited collection and overview of the field, which is summarised here. He argues that this has a number of components. Firstly, that intelligent behaviour is based on representations in the mind, knowledge structures such as concepts, beliefs, facts, procedures and models.

Secondly, the importance of reflection and the recognition that experts are better at reflection than novices. A key facet of the learning sciences is the belief that information and communication technologies (ICT) can provide a means of supporting reflection and capturing expert knowledge. Thirdly, the importance of adopting a problem-solving approach to the design and delivery of learning. This depends on the teacher having a mental representation of the problem spaces, which contain beliefs and mental representations of concepts, specific actions and the external world. Finally, the importance of thinking and in particular the importance of higher-order thinking skills.

Sawyer lists five key influences that underpin learning sciences: constructivism, cognitive science, educational technology, sociocultural studies and studies of disciplinary knowledge. Learning sciences as a field is concerned with developing a scientific understanding of learning. This includes the design and implementation of learning innovations and an aspiration to improve instructional methodologies. The real value in much of the learning sciences work is the rich, rigorous empirical studies which have been carried out, which collectively give us a much deeper understanding of authentic learning in real contexts.

Learning Objects and Open Educational Resources

Interest in learning objects emerged in the early 1990s, with the promise of creating digital resources that could be shared and reused (Littlejohn 2003). The term is contested and has been used to describe everything from digital assets up to whole integrated curricula. Wiley provides a succinct definition: 'Learning objects are educationally useful, completely self-contained chunks of content' (Wiley 2005, p. 2). They usually consist of three parts: educational objectives, instructional materials and an assessment component. Littlejohn et al. (2008) identify four levels of granularity: (1) digital assets—a single file, raw media asset; (2) information objects—structured aggregation of digital assets; (3) learning activities—tasks involving interactions with information to attend specific learning outcomes and (4) learning design—structured sequences of information and activities. Polsani defines a learning object as 'an independent and self-standing unit of learning content that is predisposed to reuse in multiple instructional contexts' (Polsani 2003). A considerable body of research has been done on the development of tools for the creation and storing of learning objects (Balatsoukas et al. 2008; Lockyer et al. 2008; Wiley 2000). However, despite the vision in terms of their potential to develop an 'educational exchange economy', the degree of actual reuse is relatively low.

More recently a related field has emerged, namely, the open educational resource (OER) movement (this is discussed in more detail in Chapter 12). Supported by organisations such as the William and Flora Hewlett Foundation[2] and UNESO,[3] the

[2] http://www.hewlett.org/

[3] http://www.unesco.org/

vision behind OER is to create free educational resources that can be shared and reused. Wiley and Gurrell (2009, p. 362) argue that OER are:

> Learning objects whose intellectual property status is clearly and intentionally labelled and licensed such that designers are free to adapt, modify and redistributed them without the need to seek permission or pay royalties.

They go on to state that OER have unlocked a new set of issues for design, namely, those around how to repurpose resources for different local contexts, taking account of linguistic and cultural issues. A number of centres for promoting and researching the use of learning objects and OER have arisen, as well as a host of online repositories. The GLOBE repository, for example, acts as a gateway to other learning object repositories.[4] The Reusable Learning Objects centre[5] aims to design, share and evaluate learning objects and has produced a tool, GLO Maker, for creating learning objects.[6] With the rise of the open educational resources movement in recent years, not surprisingly a number of support centres and community sites have emerged. OpenLearn,[7] alongside its repository of OER, created LabSpace and provided a range of tools for fostering community engagement, such as a free tool for video conferencing (FlashMeeting)[8] and a tool for visualisation (Compendium).[9] The aim was to provide an environment for sharing of good practice and promoting the reuse of OER.

LeMill is a Web-based community for finding, authoring and sharing open educational resources (OER).[10] Similarly, Connexions provides a space for educators and learners to use and reuse OER.[11] Carnegie Mellon, through its Open Learning Initiative,[12] adopts a more evidence-based approach. Finally, Carnegie Mellon and the Open University in the UK developed a global network of support for researchers and users of OER, through OLnet.[13] This is discussed in more detail in Chapter 13.

Conole and McAndrew provide a brief history of the OER movement (Conole and McAndrew 2010). However, despite the wealth of OER repositories that are now available, evaluation of their use indicates that they are not being used extensively in teaching and there is even less evidence of them being repurposed (McAndrew et al. 2009; Petrides and Jimes 2006). As such, research has begun to explore the practices around the creation, use and management of OER, with the view that if we can better identify and understand these practices, we will be able to develop approaches to improving the uptake and reuse of the OER. This is the central focus of the OPAL project,[14] which is described in more detail in Chapter 12.

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[4] http://globe-info.org/

[5] http://www.rlo-cetl.ac.uk/

[6] http://www.glomaker.org/

[7] http://openlearn.open.ac.uk

[8] http://flashmeeting.open.ac.uk/

[9] http://compendium.open.ac.uk/

[10] http://lemill.net/

[11] http://www.oercommons.org/community/rice-university-connexions

[12] http://www.oercommons.org/community/rice-university-connexions

[13] http://olnet.org/

[14] http://oer-quality.org/

Pedagogical Patterns

There has been considerable interest in recent years in the notion of pedagogical patterns. Goodyear and Retalis quoting Alexander that 'a pattern is a solution to a recurrent problem in a context' (Goodyear and Retalis 2010, p. 15). These are seen as one way of helping practitioners make informed decisions in the creation of e-learning designs (Chatteur et al. 2010, p. 183). Bergin states that a pattern is supposed to capture best practice in some domain. Pedagogical patterns try to capture expert knowledge of the practice of teaching (Bergin n.d.). Similarly, Carle et al. suggest that the idea is to identify teaching practice and record this in a format that facilitates a common vocabulary that encourages repurposing (Carle et al. 2007). They describe the Pattern-Annotate Course Tool (PACT),[15] which is a visual editor designed to unify a number of curriculum design tasks under a common platform that pushes the user towards best practice in pedagogy.

The concept of pedagogical patterns is derived from the work of Alexander et al. (1977; Alexander 1977). They define a pattern as something that:

> Describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice. (Alexander et al. 1977, p. x)

Patterns are described in a set format and are part of a larger pattern language and have the following structure:

- A picture
- An introductory paragraph setting the context for the pattern
- A headline giving the essence of the problem
- The body of the problem
- The solution
- A diagrammatic representation of the solution
- A paragraph relating the pattern to similar patterns

E-learning design experience is often shared informally in the everyday language of teaching practice, and arguably patterns provide a means of abstracting and representing good practice. Garzotto and Retalis (2008, p. 120) cite a number of key projects in the area of pedagogical patterns; these include: the design patterns in the e-learning Pointer project,[16] the ELEN project[17] and the TELL project.[18] Goodyear and Yang (2008, p. 173) also note the Pedagogical Patterns Project (PPP),[19] which developed four pattern languages around: active learning, feedback, experiential learning and gaining different perspectives. Garzotto and Retalis (2010) outline a similar taxonomy for e-learning design patterns, in terms of patterns about

[15] http://www.cs.berkeley.edu/~acarle/PACT/

[16] http://www.comp.lancs.as.uk/computing/research/cseg/projects/pointer/pointer,html

[17] http://www2.tisip.no/E-LEN

[18] http://cosy.ted.unipi/gr/tell

[19] http://www.pedagogicalpatterns.org/

human actors, pedagogical strategies, learning resources and technological tools and services.

Frizell and Hubscher (2008, p. 147) suggest that there are three benefits of design patterns: firstly, that they can serve as a design tool; secondly, that they provide a concise and accurate communication amongst designers; and, thirdly, that they can be used to disseminate expert knowledge to novices. They also present a design framework for e-learning patterns (2008, p. 156), which consists of the following: designing for interactivity; providing problem-solving activities; encouraging student participation; encouraging student expression; providing multiple perspectives on content; providing multiple representations of data, including authentic content and activities; providing structure to the learning process; giving feedback and guidance; and providing support aides. In essence, it covers the full range of good pedagogical practice.

Goodyear (2005) argues that pedagogical patterns can provide a useful mechanism to enable teachers to make informed design decisions about the use of technologies to support learning. He lists the following advantages:

- Provide the teacher-designer with a comprehensive set of design ideas.
- Provide these design ideas in a structured way, so that relationships between design components (design patterns) are easy to understand.
- Combine a clear articulation of a design problem and a design solution, offering a rationale which bridges between pedagogical philosophy, research-based evidence and experiential knowledge of design.
- Encode this knowledge in such a way that it supports an iterative, fluid process of design.

He defines educational design as: 'a set of practices involved in constructing practices of turning these representations into real support for learning (materials, task specifications, tools, etc.)'. He identifies a number of layers and components associated with educational design: pedagogical framework (philosophy, high-level pedagogy, pedagogical strategy and pedagogical tactics), educational setting (environment, tasks, organisational forms, student activity) and learning outcomes (Fig. 3.4).

Magnussen (2006) argues that the Pedagogical Patterns Project was based on the premise that 'effectively communicating complex technologies is often a struggle for information technology instructors'. The goal was to create a method to document and share best practices in teaching and learning. Principles included the following: (1) The focus needs to be on students; (2) learning happens best in environments where mentally active processes are supported; and (3) students learn differently. He goes on to argue that pedagogical patterns focus on practices that have been thoroughly tested and proven useful.

Drawing on the outputs from the Learning Patterns and Pattern Learning Network projects, Mor et al.'s book (2012) provides a set of themed solutions for practitioners, including a set of case studies, patterns and solutions in the form of future scenarios. The book covers four types of patterns: learner-centred design as reflection and adaptation, learning as collaboration, social media and assessment.

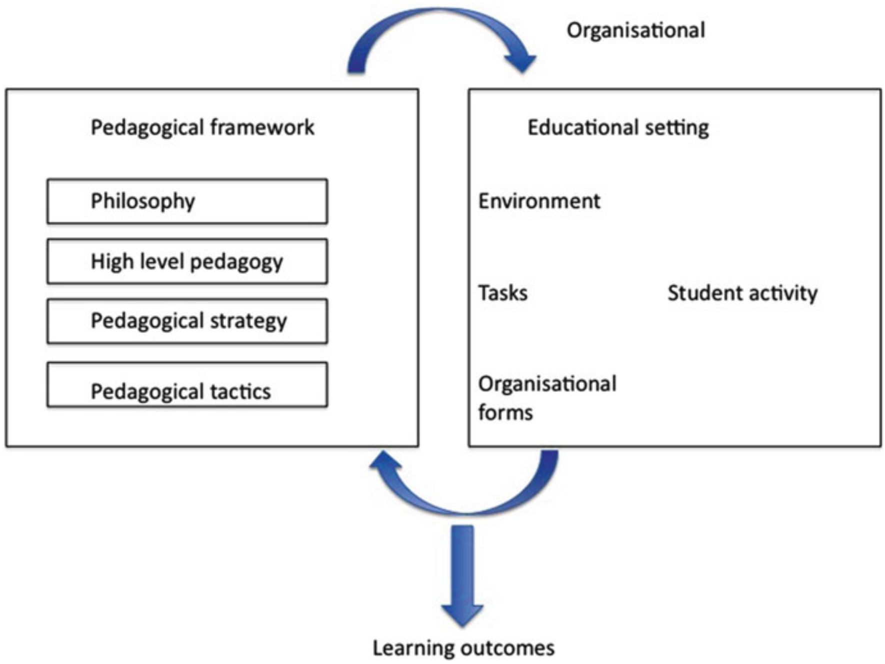

Fig. 3.4 Goodyear's educational framework

A brief description of a pattern in each of these areas is described below. Draft chapters of the book are available online.[20]

Interactive lecture pattern: This pattern demonstrates how interactivity can be incorporated into a lecture, through the inclusion of an electronic diary service, interactive spaces for teamwork and personal as well as interpersonal reflection. Forces[21] relating to the pattern include that (1) lecturers should facilitate good learning in their lectures and (2) learners want to pass the assessment mode of the lecture. The solution focuses on achieving increasing freedom, responsibility and awareness of the learners. The pattern includes (1) lectures, (2) keeping a diary, (3) elaboration of a team project, (4) self- and/or peer evaluation and (5) summative assessment.

Course design as a collaborative learning experience: The Internet enables people based in different countries to collaborate on course design and development; however, there may still be cultural differences to overcome. It can be seen as a project-based learning experience where the course team members co-learn from each other. The course design process is iterative and should include time for reflection and feedback.

[20] http://www.practicalpatternsbook.org/Home

[21] Forces are essentially the constraints or influences associated with the problem that is being solved.

Online forum for e-learning: Learners need to communicate with each other about their course; how can one design a forum to facilitate and encourage collaborative learning? Forces include isolation, lacking of coaching, the need for socialisation, the need to stay on topic, a time for reflective practice, the ability to have both public and private communication, and time constraints. Learners have two types of content: announcements and messages. The latter contain the bulk of the content and are the source of interaction between learners, including questions and answers, information, pointers to other information sources and rich media elements.

Try once, refine once: This pattern is particularly relevant to the formative assessment of skills-based courses. Learners are set exercises that allow them to practise their skills and are then given feedback on errors. The pattern aims to provide learners with an effective incentive to correct their work. The pattern includes the following two components: try and refine.

The focus of pedagogical patterns work to date has been primarily on capturing and representing patterns, rather than their use in practice. This needs to change if we are going to get better uptake and use of patterns to support educational design. In addition, further work needs to be done to develop pedagogical pattern languages, which show the relationship between different types of patterns. Also it would be interesting to explore how patterns can be mapped to how technologies can be used to promote different forms of learning.

Professional Networks and Support Centres

Finally, over the past 20 years or so, a range of professional networks and support centres have emerged, which have as part of their remit a role in promoting good practice. Some have a specific focus on technologies (e.g. the Association for Learning Technology[22] in the UK, ASCILITE[23] in Australia, AECT[24] in North America and STELLAR[25] in Europe); others are either focused on educational practices or subject disciplines (e.g. the Higher Education Academy subject centres).[26] In addition, it is relatively common now for institutions to have some form of specialised unit concerned with promoting good approaches to learning and teaching practice and to helping practitioners think about how they can use technologies more effectively.

Conole et al. (2007) provide an overview of e-learning policy directives in the UK from the 1960s through to 2000. They trace the relationship of policy and associated funding with the establishment of initiatives on the ground, including

[22] http://www.alt.ac.uk/

[23] http://www.ascilite.org.au/

[24] http://www.aect.org/

[25] http://www.stellarnet.eu

[26] http://www.heacademy.ac.uk/subjectcentres

the establishment of the type of support networks described above. Conole (2007) provides an overview of international e-learning policies and practices. She documented the different influences and policy perspectives associated with different continents and showed how these influenced practice. For example, Europe is dominated by a sociocultural approach, around notions of social inclusion and lifelong learning. In contrast, North American policy is fragmented and aligns more closely with commercial imperatives. In both cases, it is evident that there is a direct link between the policy directives and what happens in practice.

In addition to these support centres, there is also an international network of researchers and developers interested in exploring the use of technologies in education. Many of these have associated journals, conferences, workshops and seminar series, as well as a range of mechanisms for connecting members virtually via mailing lists, forums and social networking tools. These networks and support centres provide a range of mechanisms for supporting practice—facilitation of workshops and conferences, online events and discussions spaces, repositories of resources and case studies of good practice.

Conclusion

This chapter has outlined a number of research fields that are closely aligned to learning design. It has described the origins of each and the associated theoretical underpinnings. It has attempted to articulate the essence of these as well as explain their relationship to the learning design methodology described in this book. Learning design draws on these related fields, for example, by building on the inherent principles of instructional design, through taking account of the empirical evidence from the learning sciences and through use of pedagogical patterns, learning objects and open educational resources as examples of good practice and as mechanisms for guiding the design process.

References

Alexander, C. (1977). *Pattern languages*. New York: Oxford University Press.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction* (Vol. 2). New York: Oxford University Press.

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching and assessment: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

Balatsoukas, P., Morris, A., & O'Brian, A. (2008). Learning objects update: Review and critical approach to content aggregation. *Educational Technology and Society, 11*(2), 119–130. Available online at http://www.ifests.info/journals/11_2/11.pdf. Accessed 11 Aug 2011.

Bergin, J. (n.d.). *Some pedagogical patterns*. Available online at http://csis.pace.edu/~bergin/patterns/fewpedpats.html. Accessed 11 Aug 2011.

Bloom, B. S. (1956). *Taxonomy of educational objectives, the classification of educational goals: Handbook 1 – Cognitive domain*. New York: McKay.

Bransford, J. D., Brown, A., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience and school – Expanded edition*. Washington, DC: National Academy Press.

Carle, A., Clancy, M., & Canny, J. (2007, March 7–10). *Working with pedagogical patterns in PACT: Initial applications and observations*. Paper presented at the SIGSCE, Kentucky.

Chatteur, F., Carvalho, L., & Dong, A. (2010). Embedding pedagogical principles and theories into design patterns. In P. Goodyear & S. Retalis (Eds.), *Technology-enhanced learning: Design patterns and pattern languages* (pp. 183–200). Rotterdam: Sense Publishers.

Conole, G. (2007). Relationship between policy and practice – The gap between rhetoric and reality. In R. Andrews & C. Haythornthwaite (Eds.), *The Sage handbook of e-learning research, e-learning research handbook* (pp. 286–310). London: Sage.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hershey: IGI Global.

Conole, G., & McAndrew, P. (2010). A new approach to supporting the design and use of OER: Harnessing the power of Web 2.0. In M. Edner & M. Schiefner (Eds.), *Looking toward the future of technology enhanced education: Ubiquitous learning and the digital nature*. Hershey: IGI Global.

Conole, G., Smith, J., & White, S. (2007). A critique of the impact of policy and funding. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research*. London: RoutledgeFalmer.

Design, I. (n.d.). *The instructional design website*. Available online at http://www.instructionaldesign.org/. Accessed 17 June 2010.

Frizell, S. S., & Hubscher, R. (2008). Using design patterns to support e-learning design. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies* (pp. 144–166). Hershey: IGI Global.

Gagné, R. M. (1965). *The conditions of learning*. New York: Holt, Rinehart and Winston.

Gagné, R. (1985). *The conditions of learning and theory of instruction* (4th ed.). New York: Holt, Rinehart and Winston.

Garzotto, F., & Retalis, S. (2008). A critical perspective on design patterns for e-learning. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects* (pp. 113–143). Hershey: IGI Global.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology, 21*(1), 82–101.

Goodyear, P., & Retalis, S. (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers.

Goodyear, P., & Yang, D. F. (2008). Patterns and pattern languages: Supporting understanding and performance in educational design. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies*. Hershey: IGI Global.

Gustafson, K. L., & Tillman, M. H. (1991). Introduction. In L. J. Briggs, K. L. Gustafson, & M. H. Tillman (Eds.), *Instructional design: Principles and applications* (2nd ed., pp. 3–8). Englewood Cliffs: Educational Technology Publishers.

Hohanson, B., Miller, C., & Hooper, S. (2008). Commodity, firmness, and delight: Four modes of instructional design practice. In L. Botturi & T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 1–17). Hershey/New York: Information Science Reference.

Littlejohn, A. (2003). *Reusing online resources: A sustainable approach to e-learning*. London: RoutledgeFalmer.

Littlejohn, A., Falconer, I., & McGill, L. (2008). Characterising effective eLearning resources. *Computers and Education, 50*(3), 757–771. Available online at http://www.academy.gcal.ac.uk/people/falconer.html. Accessed 11 Aug 2011.

Lockyer, L., Bennett, S., Agostinho, S., & Harper, B. (2008). *Handbook of research on learning design and learning objects*. Hershey: IGI Global.

Magnussen, E. (2006, June). *Pedagogical patterns – A method to capture best practices in teaching and learning*. Paper presented at the 4:e ogiska inspirationskonferensen, LTH, Lund University.
McAndrew, P., Santos, A., Lane, A., Godwin, S., Okada, A., & Wilson, T. (2009). *OpenLearn research report 2006–2008*. Milton Keynes: The Open University.
Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development, 50*(3), 43–59.
Merrill, M. D. (2009). First principles of instruction. In C. M. Reigeluth & A. Carr-Chellman (Eds.), *Instructional design theories and models III*. New York: Lawrence Erlbaum Associates.
Mor, Y., Warburton, S., & Winters, N. (2012). *Practical design patterns for teaching and learning with technology*. London: Sense Publishers.
Papert, S. (1993). *Mindstorms*. New York: Basic Books.
Petrides, L., & Jimes, C. (2006). Open educational resources: Towards a new educational paradigm. *iJournal, 14*. Available online at http://www.ijournal.us/issue_14/ij_14_04_articleframe_Petrides_Jimes. Accessed 20 Sept 2011.
Polsani, P. R. (2003). Use and abuse of reusable learning objects. *Journal of Digital information, 3*(4). 2003–02. Available online at http://journals.tdl.org/jodi/article/viewArticle/89/88. Accessed 11 Aug 2011.
Reigeluth, C. M. (1983). *Instructional-design theories and models: An overview of their current status*. New York: Routledge.
Reigeluth, C. M., & Carr-Chellman, A. A. (2009). *Instructional-design theories and models* (Vol. III). London: Routledge.
Reiser, R. A. (2001). The history of instructional design and technology: Part 1: A history of instructional media. *ETRandD, 49*(1), 53–64.
Sawyer, R. K. (2006). *The Cambridge handbook of the learning sciences*. Cambridge: Cambridge University Press.
Sutcliffe, A. (2003). *Multimedia and virtual reality – Designing multisensory user interfaces*. Mahwah: Lawrence Erlbaum Associates.
Van Merrienboer, J. J. G., & Boot, E. (2005). A holistic pedagogical view of learning objects: Future directions for reuse. In J. M. Spector, C. Ohrazada, A. V. Schaack, & D. A. Wiley (Eds.), *Innovations in instructional technology*. Mahwah: Lawrence Erlbaum Associates.
Wiley, D. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor and a taxonomy. *Learning Technology, 2830*(435), 1–35.
Wiley, D. (2005). Learning objects in public and Higher Education. In J. M. Spector, C. Ohrazda, A. V. Schaack, & D. A. Wiley (Eds.), *Innovations in instructional technology*. Mahwah: Lawrence Erlbaum Associates.
Wiley, D., & Gurrell, S. (2009). A decade of development…. *Open Learning: The Journal of Open and Distance Learning, 24*(1), 11–21. http://www.informaworld.com/10.1080/02680510802627746. Accessed 11 Aug 2011.

Chapter 4
Open, Social and Participatory Media

Introduction

The emergence of open, social and participatory media in recent years is changing the landscape of technology practices. They are changing the ways in which users interact, communicate and participate with technologies. These technologies include social networking sites such as Facebook,[1] LinkedIn,[2] and Myspace,[3] blogs and wikis and microblogging sites such as Twitter.[4] They are being used for a mixture of social and professional activities. This chapter considers the impact of such Web 2.0 technologies on education and in particular how these new technologies are changing learning and teaching practices. It will consider their fundamental characteristics and look at the implications for learners, teachers and institutions. It argues that the impact on practice can be both positive and negative and that as a consequence educational institutions need to develop new policies and strategies to take account of these.

This chapter will consider the new forms of user behaviour that are resulting and provide examples of ways in which they are being used to support learning and teaching. The central focus is a critique of the impact of new technologies on education, which raises a number of key questions: What new digital literacy skills are needed? What does it mean to be a learner or teacher in this new environment? What are the implications for organisational structures and processes? What new learning spaces need to be developed to harness the potential of new technologies? Building on this chapter, Chapter 14 considers the new forms of online communities and interactions that are emerging in these online spaces. Chapter 15 looks at a social networking site, Cloudworks,[5] which has been developed to support the discussion and sharing of learning and teaching ideas.

[1] http://facebook.com

[2] http://www.linkedin.com

[3] http://www.myspace.com/

[4] http://twitter.com

[5] http://cloudworks.ac.uk

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The Changing Digital Landscape of Education

There can be little doubt that digital technologies now infiltrate all aspects of our lives; electronic plane tickets, ubiquitous wifi, mobile technologies and technologies such as smartphones and tablets are becoming necessities rather than luxuries for many. Certainly, within the developed world, most of us have an expectation of a certain level of digital connectivity and indeed rely on it, feeling cheated or that we are working below par without it. The pace of change is unlikely to slow down and arguably there are more fundamental changes coming as the true impact of embracing cloud computing in education becomes evident (Dong et al. 2009; Katz 2008).

New technologies provide a plethora of routes for finding and using information and for communication and collaboration. Alongside the established communication channels of the telephone, email, forums and texting, the emergence of Web 2.0 technologies in recent years has added blogging (and microblogging), wikis, social networking sites, virtual worlds and Internet-based voice over Internet protocol (VOIP) and in particular popular tools such as Skype which enable virtually free, Internet-based communication. Similarly information can now be distributed in multiple locations and packaged and presented using a range of different multimedia and visual representations. Sophisticated repositories now exist for everything from shopping online to repositories of good practice and free resources. RSS feeds and email alerts enable users to filter and personalise the information they receive. Social bookmarking and tagging means that collective value can be added to digital objects; concept and mind mapping, tag clouds and data-derived maps are only some of the ways in which information can be presented in rich and multifaceted ways. Within this context, we are seeing a number of trends:

- A shift from the Web as a content repository and information mechanism to a Web that enables more social mediation and user generation of content.
- New practices of sharing (such as the use of Flickr for images,[6] YouTube for videos[7] and SlideShare for presentations)[8] and mechanisms for content production, communication and collaboration (through blogs, wikis and microblogging services such as Twitter). Social networking sites provide a mechanism for connecting people and supporting different communities of practice (such as Facebook, Elgg[9] and Ning).[10]
- A scale or 'network effect' is emerging as a result of the quantity of information available on the Web, the multiplicity of connectivity and the scale of user participation and as a result new possibilities for sharing and harnessing these 'network effects' are occurring.

[6] http://flickr.com

[7] http://youtube.com

[8] http://slideshare.com

[9] http://elgg.org

[10] http://www.ning.com

These trends point to new ways in which users are behaving in online spaces. They provide a range of opportunities for supporting learning and teaching practices. The Web is now more participatory, supporting more open practices. The nature of openness is discussed in more detail in Chapter 11.

A Review of New Technologies

O'Reilly introduced the term Web 2.0 technologies to describe the emergence of new open, social and participatory technologies (O'Reilly 2004, 2005). In particular, the term emphasised a shift from a static Web 1.0 to a Web 2.0 environment that was characterised by user participation. He defined Web 2.0 as a set of principles and practices. The term 'open, social and participatory media' has also been used, emphasising the core characteristics of these new technologies. These characteristics include users as publishers, harnessing distributed collective intelligence (Lévy 1997), user-evolving folksonomies (Mathes 2004; Nozuri 2006), peer production and critique, the wisdom of the crowds (Surowiecki 2004), the architecture of participation (O'Reilly 2004), the notion of the perpetual beta, free tools and resources and the notion of openness.[11]

The Characteristics of New Technologies

The characteristics of these new technologies include the following:

- Peer critiquing: The ability to openingly comment on other people's work. This has become standard practice within the blogosphere and is being used in general society. For example, a growing number of authors and journalists are now active bloggers and traditional book writing is being supplemented by writers keeping a blog and inviting readers to comment on the evolving plot, by academics (through self-reflective blogs on digital scholarship and research ideas) and by learners (in terms of keeping their own reflective blogs or contributing to a collective cohort blog).
- User-generated content: There are now many different tools for creating content (ranging from those which are primarily text based through to rich multimedia and interactive tools), meaning that the Web is no longer a passive media for consumption, but an active, participatory, productive media. Sites such as YouTube,[12] Flickr[13] and SlideShare[14] facilitate sharing of user-generated content,

[11] The notion of openness is discussed in more detail in Chapter 11.

[12] www.youtube.com

[13] http://www.flickr.com/

[14] http://www.slideshare.net/

and the embedded code functionality means that content can be simultaneously distributed via a range of communication channels.
- Collective aggregation: Hierarchy and controlled structures make little sense in an environment that consists of a constantly expanding body of content that can be connected in a multitude of ways. Collective aggregation refers both to the ways in which individuals can collate and order content to suit their individual needs and personal preferences and the ways individual content can be enriched collectively by the wider community (via tagging, multiple distribution, etc.). Social bookmarking, tag clouds and associated visualisation tools, tagging, RSS feeds and embedding code all enable collective aggregation to occur.
- Community formation: Clearly the connectivity and rich communicative channels now available on the Web provide an environment for supporting a rich diversity of digital communities. Boundaries of professional and personal identity are eroding and the notion of tightly knit communities of practice (Wenger 1998) is giving way to a spectrum of communities from individualistic spaces through loosely bound and often transitory collectives through to more established and clearly defined communities. See Dron and Anderson (2007) for a more specific discussion of collectives, networks and groups in social networking for e-learning. I will return to the forms of new online communities and interactions in Chapter 14.
- Digital personas: Individuals need to define their digital identity and how they 'present' themselves across these spaces (Solove 2004). The avatars we choose to represent ourselves, the style of language we use and the degree to which we are open (both professionally and personally) within these spaces give a collective picture of how we are viewed by others.

The Impact of Web 2.0 Technologies

There is now a growing body of empirical evidence on the impact of Web 2.0 technologies on education; see, for example, a review of learning 2.0 by Redecker et al. (2009), the use of Web 2.0 in schools (Crook et al. 2008), the NSF task force on cyberlearning (Borgeman et al. 2008), the most recent Horizon report on future technological trends (NMC 2012) and the OECD report on 'new millennial learners' (OECD 2007).

More specifically a number of articles consider the use of these technologies in an educational context (Anderson 2007; Downes 2005; Ebner 2007). Downes describes the change as a shift from the Web being a medium in which information is passively consumed to a platform, where content is created, shared, remixed and repurposed by users (Downes 2005). He describes the way blogs and wikis have emerged as new media for expression and the development of online communities. Application of these tools, he argues, means that e-learning content is created and distributed in a variety of different ways, enabling more learner-centred approaches. Anderson (2007) considers the implications of these technologies for higher education. He argues that Web 2.0 is more than a set of cool technologies, they are changing the ways in which people interact, whilst Ebner (2007) considers the reality behind the hype around Web 2.0 technologies and in particular their advantages and disadvantages.

De Frietas and Conole (2010) also argue that there has been a shift in the use of tools, which emphasises the more participatory and communicative capabilities of new technologies. These enable content and information to be distributed in a variety of different ways and hence, the nature of content, both in terms of production and distribution, has shifted with greater control for the individual as producer and user. So whereas initial use of the Web was essentially fairly static with hyperlinked information pages displaying information, Web 2.0 shifts towards a more active and distributed network with user-generated content and a much richer, interconnected network of communicative channels. They further refine this shift as being about a shift from information being a scarce, expensive commodity to an abundance of information, challenging traditional notions of authority and finally that content can be distributed and rendered in multiple ways. They list a number of ways in which these technologies can be aligned with modern thinking about adopting more constructivist and situative learning approaches. Web 2.0 practices enable the shifting of learning from a focus on individual to social learning. Location-aware technologies can enable contextualised and situated learning. The adaptable functionality of Web 2.0 tools means that learners can personalise their learning. Virtual worlds can be used to support experiential and authentic learning, whilst search engines like Google can support inquiry- and resource-based learning. User-generated content has resulted in a plethora of open educational resources (OER) now being freely available. And finally tools such as blogs, e-portfolios and online games such as World of Warcraft[15] are being used to support peer learning and reflection.

Redecker et al. (2009, p. 19) undertook a review of the use of Web 2.0 technologies in education. They define Web 2.0 as 'the range of digital applications that enable interaction, collaboration and sharing between users'. These tools include blogs, wikis, social bookmarking and tagging, media sharing services, podcasts and virtual worlds. Effective use of these tools requires learners and teachers to develop new skills, not only to manage the abundance of information, but also to participate in distributed networks and to develop critical communicative, collaborative and creative skills.

These tools enable pedagogical innovation through promoting personalisation and collaborative learning and are resulting in a change in the roles of learners and teachers. Redecker et al. (2009) also argue that the lack of widespread take-up of these tools can be attributed to a number of barriers, such as a lack of access to ICT, learners and teachers lacking the necessary digital literacy skills to make effective use of these technologies, a lack of the pedagogical skills needed to design effective learning interventions utilising the affordances[16] of these technologies, as well as concerns over security and privacy.

[15] http://us.battle.net/en/

[16] This is discussed in Chapter 6.

The Use of Web 2.0 Technologies in Education

Table 4.1 provides some examples of how Web 2.0 tools are being used in education, including a description, in each case, of the potential impact on education. These indicate that these tools can result in pedagogical innovation in a number of ways. Firstly, by providing new ways of collaborative creation and exchange of learning content. Secondly, by providing new forms of communication amongst learners and teachers. Thirdly, by providing more personalised and learner-centred environments. Fourthly, these are resulting in new forms of blended learning contexts emerging. Fifthly, they are motivational in terms of providing active, discovery-based learning approaches and a sense of learner ownership.

The examples cited in Table 4.1 demonstrate the rich ways in which technologies can be used to support learning, in terms of enabling new forms of communication, collaboration and co-construction of knowledge; aggregation of resources; supporting different forms of pedagogy; and providing authentic environments for role-based learning.

Impact on Practice

Conole (2009; 2010) synthesises some of the characteristics that define these new technologies and lists their impact on practice (both positive and negative). These include the impact of free tools, resources and services; ubiquitous access; multiple communication and distributions channels; media-rich representations; user-generated content and social profiling. This section will describe each of these in turn. Table 4.2 summarises the characteristics of new technologies and their potential positive and negative impact.

The Internet has enabled access to a vast amount of information and, with the growth of the open educational resource movement (Atkins et al. 2007), access to free resources. However, finding appropriate resources and knowing how to use them is a specialised skill. Many learners, despite being competent technology users, lack the appropriate academic literacy skills to appropriate these free resources for their learning (Jenkins et al. 2006; Jenkins 2009; Lankshear and Knobel 2006). McAndrew et al. (2008) considered Web 2.0 characteristics and compared them against the way in which open educational resources (OER) are developed and used, drawing on evaluation data on the use of the OpenLearn site.[17] For example, they argue that such sites align well with the long-tail phenomenon (Anderson 2004) by providing access to specialist subjects. Similarly, the social tools associated with the site enable users to contribute ideas and adapt content providing an example of the Web 2.0 user-generated content and the broader notion of users adding value within a Web 2.0 context. The availability of free tools means that students can appropriate

[17] http://openlearn.open.ac.uk

Table 4.1 Examples of how Web 2.0 tools are being used in education

Theme area	Case study	Brief description of case study	Potential impact upon education
Scaffolded	VEOU (Wills 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, personalised and just-in-time training
Open	E-Bank – towards truly "Open research", (Coles et al. 2006) MIT OpenCourseWare (http://ocw.mit.edu/)	Access to open learning materials designed to support both learners and teachers	Democratisation 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)– A free online course	An experimental course in which both the content and expertise is free. This kind of course is commonly referred to as a massive online open course (MOOC)	What is the role of traditional educational institutions in a world in which content and expertise are increasingly free?
Social	Cloudworks (Conole and Culver 2009, 2010)	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 the 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. Pedagogical models include exploratory learning, inquiry learning and problem-based learning approaches
Fostering inquiry learning	The Personal Inquiry Project (Sharples and Scanlon 2011)	Development of inquiry-based learning skills for students to enhance their understanding of science	Through independent learning approaches, peer learning is encouraged and analytical skills may be fostered

(continued)

Table 4.1 (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)	Young people in hospitals, interactive gaming, life swapping and sharing of experience	The potential for these tools to support lifelong learning opportunities and enhance life experiences
	JISC MyPlan project, http://www.jisc.ac.uk/whatwedo/programmes/elearningcapitcal/xinstit1/myplan.aspx	The MyPlan project provided tools for lifelong career decisions and educational choices using visualisation of learners' timelines www.lkl.ac.uk/research/myplan	
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 (Computer Supported Collaborative Learning) pedagogical patterns (Hernández et al. 2011)	Structured pedagogical patterns to support different forms of collaborative activities	Broader application of pedagogical patterns and other scaffolded forms of pedagogy 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	Welker's Wikinomics (cited in Ala-Mutka et al. 2009)	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
	The Decameron Web (http://www.brown.edu/Departments/Italian_Studies/dWeb/dWeb.shtml)	An interactive online text	
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

Table 4.2 Characteristics of new technologies and impact on practice

Change	Positive impact	Negative impact
Free tools, resources and services	Specialised niche use, access and personalisation	Inappropriate academic literacy skills, lack of institutional control
Ubiquitous access	Technology as a core tool for learning	Narrower but deeper digital divide
Multiple communication and distribution channels	Increased opportunity for peer and tutor dialogue, information repurposed to meet different needs	Fragmentation of voice, no centralised repository of knowledge
Media-rich representations	New forms of sense making	Lack of new forms of digital literacy
User-generated content and social profiling	Variety and acknowledging individual contributions, knowledge sharing and community building	Quality assurance issues, inappropriate descriptions and use of personal information for other purposes

and personalise these for their individual learning needs. However, there is a tension between these tools and those under institutional control. If students are able to use free email tools, wikis, blogs, etc., what is the function of an institutional learning management system (LMS), and what, if any, tools and services should institutions be providing? See Al-Zoube (2009) for a discussion of e-learning in the cloud.

Web 2.0 practices rely on scale, both in terms of access to a vast array of user-generated content and through harnessing the power of the collective—the so-called notion of ‘the wisdom of the crowds’ (Surowiecki 2004). Such scale requires easy access, and in this respect, in the development world at least, we are approaching a state of near ubiquitous access; with wifi almost universally available, the percentage of those online is approaching 100% in most developing countries; however, the digital divide is still evident—narrower but deeper (Warschauer 2004). Warschauer critiques the relationship between access to information and communication technologies and social inclusion. He argues that ‘the ability to access, adapt and create new knowledge using new information and communication technologies is critical to social inclusion in today’s era’ (Warschauer 2004, p. 9).

The variety of communicative channels and multiple distribution mechanisms for retrieving and aggregating information means that there are a multitude of opportunities for finding resources and communicating with peers or experts. However, this has also led to a ‘fragmentation of voice’—there is no longer one definitive source of knowledge, no one ‘expert’. Learners need to develop strategies for finding and validating appropriate resources. Learners and teachers have a variety of communicating channels (email, chat, blogs, audio and video conferences, social networking sites, etc.); there is no single communicative channel. This multiplicity can be confusing and disorientating for both learners and teachers.

The richness of the new media means it is possible for new forms of representation, providing new opportunities in terms of sense making (Okada et al. 2008), but raises issues in terms of whether students and teachers have the appropriate digital literacy skills to utilise these representations (Seely Brown 2006).

The user participation and social practices of Web 2.0 technologies clearly provide immense opportunities in terms of fostering collaboration and for co-construction and sharing of knowledge but raise a number of issues about quality, copyright and privacy. Table 4.2 summarises the positive and negative impacts of the different characteristics of these new social and participatory technologies.

A Review of Web 2.0 Tools and Practice

Conole and Alevizou (2010) undertook a review of the use of Web 2.0 technologies in education, building on the review by Redecker et al. (2009). They focused in particular on the use of these tools in higher education. They adapted a taxonomy of types of the types of Web 2.0 tools developed by Crook et al. (2008) based on the functionality of different tools:

- Media sharing: creation and exchange of media with peers
- Media manipulation and data/Web mashups[18]: tools to design and edit digital media files and combine data from multiple sources to create a new application, tool or service
- Instant messaging, chat and conversational areas: to enable one-to-one or one-to-many conversations
- Online games and virtual worlds: rule-governed games or themed environments
- Social networking: enabling social interactions between friends and peers
- Blogging: where users can post text that others can comment on
- Social bookmarking: aggregation and tagging of Web resources
- Recommender systems: that aggregate and tag user preferences and make recommendations
- Wikis and collaborative editing tools: where users can collaboratively create, edit and link pages
- Syndication: where users can subscribe to RSS feed-enabled websites

Jenkins et al. (2006; Jenkins 2009) argue that a new set of digital literacies are needed for learners and teachers to be part of what they describe as this new ‘participatory culture’. These are play, performance, simulation, appropriation, multitasking, distributed cognition, collective intelligence, judgement, transmedia navigation, networking, negotiation and visualisation. Similarly, Beetham et al. (2009) provide a comprehensive framework of new literacies relating to social and situated practice. These include meaning making and situated knowledge, technological and media literacies, and scaffolded and metacognitive literacies. They argue that today’s learners need to develop the following capabilities: managing work/life

[18] A mashup is a Web page or application that uses and combines data, presentation or functionality from two or more sources to create new services.

balance, social entrepreneurialism, development and projection of identities, communicating and collaborating across national and international boundaries, contributing to knowledge and understanding in hybrid networks of people and non-human cognitive agents, managing career and learning paths, exercising judgement, acting ethically, reflecting/planning/seeking support from others, assessing and addressing threats, and exercising multiple modes of meaning making.

Conole and Alevizou provide a description of the ways in which Web 2.0 technologies are being used to support learning and teaching and how these relate to different pedagogical approaches. An adapted version of this is shown in Table 4.3. What is evident is that the characteristics of Web 2.0 technologies appear to align well with modern pedagogical good practice in terms of promoting constructivist and situative approaches to learning. De Freitas and Conole (2010, p. 19) argue that:

> 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 tantalising 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.

Learning Spaces

A number of researchers are now exploring what new forms of learning spaces might be needed to effectively use new technologies in a blended learning context, for example, the Spaces for Knowledge Generation (SKG) project,[19] which aimed to inform, guide and support sustainable development of learning and teaching spaces and practices. It was influenced by constructivist approaches and aimed to design new learning spaces and use of technologies that fostered more learner-centred approaches to learning. In contrast, Cummings (2011) focused on the kinds of the learning spaces that might be needed to promote experiential learning.

Boys (2010) looks at how learning spaces can be used to foster creativity. She argues that we need to rethink the architecture of educational spaces and that this will challenge some of the perceived wisdom of existing learning spaces. See also the 'spaces for learning in art and design' blog,[20] which is a collective set of resources on learning spaces.

In the UK, the Joint Information Systems Committee (JISC) undertook a programme of work around learning spaces (JISC 2006). In the introduction to the report, it is argued that:

> Learning is changing in the twenty-first century. Technologies used in learning, such as interactive whiteboards, personal learning environments, wireless networks and mobile devices, plus the internet and high-quality digital learning resources—and the ability to

[19] http://www.skgproject.com/

[20] http://www.spacesforlearning.blogspot.com/

Table 4.3 Mapping of Web 2.0 tools to different pedagogical approaches

Pedagogical approaches	Web 2.0 tools and approaches	Examples
Personal learning	The ability to adapt, customise and personalise; use of RSS feeds, mashups and APIs	The digital learning communities project (http://www.thedlc.org/)
Situated learning, experiential learning, problem-based learning, scenario-based learning, role play	Use of location-aware functionality, immersive 3D worlds, use of search engines and other online resources as sources of evidence, connection with peers and experts via social networking tools, scenario-based and authentic tasks in virtual worlds, application of gaming technologies for educational purposes	The iCamp project, use of SecondLife to support different disciplines (http://www.icamp.eu/) Cyberone law role-play (Rooney and Mac Namee 2007)
Inquiry-based learning, resource-based learning	Tools to support user-generated content and facilitating easy sharing and discussion, media repositories (Flickr, YouTube and SlideShare), social bookmarking sites (Delicious), digital repositories and tools for content generation, use of search engines, participation in distributed virtual communities, use of folksonomies and social bookmarking as mechanisms for finding and organising resources	The open educational resource movement and associated tools and repositories, like OpenLearn
Reflective and dialogic learning, peer learning	Tools for fostering peer reflection such as blogs and e-portfolios, commenting on other learners' blog posts, co-creation of learning artefacts in wikis	Digital learning communities (http://www.thedlc.org/) The peer-to-peer mentoring framework
Communities of practice	Use of social networking tools to participate in communities of learning and/or teaching	Application of tools such as Facebook, Ning and ELGG to support informal social interactions between learners and as spaces for reflection on professional practice around shared interests, for example, the ELESIG community in Ning (http://elesig.ning.com)
Scholarly practice and the sharing of designs and good practice	Use of Web 2.0 technologies to participate in a distributed network of educators and researchers Use of blogs, Twitter and wikis to co-create knowledge and understanding, to critique practice and to share professional practice and resources	Edublogs (http://edublogs.org/), LeMill (http://lemill.net/), Cloudworks (http://cloudworks.ac.uk)

access many of these from home and the workplace—are altering the experiences and aspirations of learners.

The focus of the report is the need for more cost-effective use of spaces and the creation of technologically rich learning spaces. Factors of importance included motivating learners, encouraging collaboration, supporting personalisation and inclusion and enabling flexibility. The report reviews different examples of learning spaces, to support formal, informal and non-formal learning. These include effective use of entrances, teaching spaces, learning centres and social spaces.

Conclusion

As the examples in this chapter demonstrate, Web 2.0 tools have much to offer learning and teaching and can be used in different ways to support a wide range of pedagogical practices. However, despite pockets of good practice, on the whole, Web 2.0 technologies have not been taken up extensively in learning and teaching. Therefore, a number of challenges remain in terms of their use. These include the changing nature of learning and teaching in such spaces; the new media, information and networked literacies needed; the need for a better connection between research on the use of these tools and associated policy and practice; and the challenges with trying to change existing practice, to get learners and teachers to adopt more open approaches.

Conole and Alevizou (2010) argue that effective use of new technologies requires a radical rethink of the core learning and teaching processes, a shift from design as an internalised, implicit and individually crafted process to one that is externalised and shareable with others. They argue that change in practice may indeed involve the use of revised materials, new teaching strategies and beliefs—all in relation to education innovation.

The use of these technologies has significant implications for learners, teachers and educational institutions. Sharpe et al. (2010) provide a summary of recent research looking at the ways in which learners are using and perceiving new technologies. The research indicates that learners are changing, in terms of how they interact with technologies and how they are using them to support their learning. Learners are adopting more social, participatory and just-in-time learning practices, using search engines to find relevant resources and communicating and collaborating though a variety of mechanisms. Much of the research suggests that they are adopting more problem-based and experiential learning. However, a note of caution is also needed; although good learners are using these tools effectively, weaker learners struggle to make sense of the vast array of tools and resources at their disposal. Arguably they need guided learning pathways and support to use these effectively to support their learning.

Despite significant investment in promoting the use of technologies in education, use by teachers is far from ubiquitous. Certainly teacher roles are changing as a consequence of the introduction of new technologies, and arguably the boundaries between teachers and learners is blurring. However, there are a number of barriers to the increased uptake of technologies. Firstly, teachers lack the necessary skills to design and support learning with new technologies. Secondly, there is a tension between their role as researcher and their role as teacher, with research more often than not being privileged over teaching. Finally, they also cite a lack of time and support as barriers to experimenting with new technologies.

Finally, the increased use of technologies has a number of implications for institutions: firstly, in terms of the types of support needed to enable learners and teachers to use new technologies and, secondly, most institutions are working with legacy systems, which are fundamentally at odds with these new approaches. There is a tension between in-house systems and learning management systems (LMS) and freely available Web 2.0 tools and services (Craig 2007; Sigala 2007). The nature and structure of educational institutions is also under threat. In a world where tools and resources are increasingly free, what is the role of a traditional institution?

Despite the hype and rhetoric, Web 2.0, and more specifically learning 2.0, has not yet penetrated mainstream education. Nonetheless, the affordances[21] of Web 2.0 technologies and analysis of how they are beginning to be adopted in educational contexts suggest that they could have a profound impact in the near future and that there are a number of potential side effects of the increased use of Web 2.0 technologies, which we need to be aware of. For example, as discussed in this chapter, there are issues in terms of equity of access and the new digital literacy skills needed to make sense of these new digital spaces.

This chapter has considered the characteristics of new technologies and their impact on both organisations and individuals within an educational context. It has argued that there are significant implications for both learners and teachers. At the institutional level, there is little evidence that there is a corporate understanding of these tools either and there is the lack of vision for how social computing can be used. Policies on the use of Web 2.0 technologies are generally inadequate, and there is a lack of appropriate training and support to migrate towards greater usage of these tools.

What is evident is that uncertainty and change are the norm; it is clear that we are now working in an environment of constant flux, where the future is unpredictable and where changes appear to be ever more rapid and fundamentally radical in terms of their implications. No one individual can be an expert in all the tools and the potential ways in which they can be used; the approach needs to shift to harnessing the networked aspects of new technologies, so that individuals foster their own set of meaningful connections to support their practice, whether this is a teacher in terms of connections to support them to develop and deliver their teaching or a learner in terms of connections to support and evidence their learning.

The implications of these new technologies for learning and teaching are profound. Unintended consequences (Beck 1992) of use will arise; misuse and abuses of the system will happen; the digital divide is still present; those not engaging with technologies are getting left further and further behind. Virilio (1998) goes

[21] The concept of affordances is discussed in Chapter 6.

further and suggests that we are utterly dependent on technologies and when (not if) technologies fail it will have a catastrophic effect.

This chapter has argued that a range of new skills are needed for learners, teachers, support staff and policy makers: skills to enable them to navigate through and make sense of these new digital spaces; skills to cope with change and the exponential development of new tools; skills to deal with new notions of space, time and boundaries and skills to cope with a multifaceted and fast-moving environment. We have to accept that it is impossible to keep up with all the changes, so we need to develop coping strategies which enable individuals to create their own personal digital environment of supporting tools and networks to facilitate access to and use of relevant information for their needs. These skills are needed across the range of stakeholders involved in education from students to senior managers, not just a selective minority. The ultimate goal has to remain harnessing the potential of these technologies to provide better and more engaging learning environments and opportunities for learners.

References

Ala-Mutka, K., Bacigalupo, M., Kluzer, S., Pascu, C., Punie, Y., & Redecker, C. (2009). *Review of learning 2.0 practices* (IPTS Tech. Rep. Prepared for Publication). Seville: IPTS. Available online at http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2139. Accessed 18 Apr 2009.

Al-Zoube, M. (2009), E-learning on the cloud. *International Arab Journal of e-Technology, 1*(2). Available online at http://aou.edu.jo/aou_new/datafiles/Research/iajet/vol_1.2_2009/E-Learning%20on%20the%20Cloud.pdf. Accessed 11 Aug 2011.

Anderson, C. (2004). The long tail. *Wired Magazine*. Available online at http://www.wired.com/wired/archive/12.10/tail.html. Accessed 11 Aug 2011.

Anderson, P. (2007, February). What is Web 2.0? Ideas, technologies and implications for education. *Citeseer, JISC Technology and Standards Watch*. Available online at http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf. Accessed 11 Aug 2011.

Atkins, D. E., Seely Brown, J., & Hammond, A. L. (2007). *A review of the open educational resource movement: Achievements, challenges and new opportunities*. Report to the William and Hewlett Foundation. Available online at http://www.hewlett.org/uploads/files/ReviewoftheOERMovement.pdf. Accessed 20 Sept 2011.

Beck, U. (1992). *Risk society towards a new modernity*. London: Sage.

Beetham, H., McGill, L., & Littlejohn, A. (2009). *Thriving in the 21st century: Learning literacies for the digital age* (LLiDA Project Report). Available online at http://www.academy.gcal.ac.uk/llida/LLiDAReportJune2009.pdf. Accessed 11 Aug 2011.

Borgeman, C. L., Abelson, H., Dirks, L., Johnson, R., Koedinger, K., Linn, M. C., Lynch, C. A., Oblinger, D. G., Pea, R. D., Salen, K., Smith, M., & Azalay, A. (2008). *Fostering learning in the networked world: The cyberlearning opportunity and challenge* (Report of the NSF Task Force on Cyberlearning). Available online at http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf. Accessed 7 Oct 2011.

Boys, J. (2010). *Towards culture learning spaces: Re-thinking the architective of post–Compelxay education*. London/New York: Routledge.

Coles, S., Frey, J., Hursthouse, M., Light, M., Milsted, A., Carr, L., DeRoure, D., Gutteridge, C., Mills, H., Meacham, K., Surridge, M., Lyon, E., Heery, R., Duke, M., & Day, M. (2006). An e-science environment for service crystallography-from submission to dissemination. *Journal of Chemical Information and Modeling, Special Issue on eScience, 46*(3), 1006–1016.

Conole, G. (2009, December 8). *New digital spaces – Pushing the boundaries into the unknown; trajectories of user behaviour in new frontiers*. Invited keynote, Ascilite 2009, Auckland, New Zealand.

Conole, G. (2010). Stepping over the edge: The implications of new technologies for education. In M. J. W. Lee & C. McLoughlin (Eds.), *Web 2.0-based e-learning: Applying social informatics for tertiary teaching*. Hershey: IGI Global.

Conole, G., & Alevizou, P. (2010). *Review of the use(s) of Web 2.0 in Higher Education* (HE Academy Commissioned Report). Available online at http://www.heacademy.ac.uk/assets/EvidenceNet/Conole_Alevizou_2010.pdf. Accessed 11 Aug 2011.

Conole, G., & Culver, J. (2009). Cloudworks: Social networking for learning design. *Australasian Journal of Educational Technology, 25*(5). Available online at http://www.ascilite.org.au/ajet/ajet25/conole.html. Accessed 11 Aug 2011.

Conole, G., & Culver, J. (2010). The design of cloud works: Applying social networking practice to foster the exchange of learning and teaching ideas and designs. *Computers in Education, 54*(3), 679–692.

Craig, E. M. (2007). Changing paradigms: Managed learning environments and Web 2.0. *Campus Wide Information Systems, 24*(3), 152–161.

Crook, C., Cummings, J., Fisher, T., Graber, R., Harrison, C., & Lewin, C. (2008). *Web 2.0 technologies for learning: The current landscape – Opportunities, challenges and tensions* (A BECTA Report) Available online at http://dera.ioe.ac.uk/1474/1/becta_2008_web2_currentlandscape_litrev.pdf. Accessed 11 Aug 2011.

Cummings, D. (2011, June 15). Design considerations of experiential learning spaces, blog post. *Random Acts of Learning Blog*. http://actrandom.tumblr.com/post/6548128998/conference-paper-at-university-planning-and-design. Accessed 6 Sept 2011.

De Freitas, S., & Conole, G. (2010). Learners experiences: How pervasive and integrative tools influence expectations of study. In R. Sharpe, H. Beetham, & S. De Freitas (Eds.), *Rethinking learning for a digital age: How learners are shaping their own experiences* (pp. 15–30). London: Routledge.

Dong, B., Zheng, Q., Qiao, M., & Yang, J. (2009). Bluesky cloud framework: An e-learning framework embracing cloud computing. *Lecture Notes in Computer Science, 5931*, 577–582.

Downes, S. (2005, October 15). E-learning 2.0. *eLearn Magazine, 2005*(10). Available online at http://www.elearnmag.org/subpage.cfm?section=articlesandarticle=29-1. Accessed 11 Aug 2011.

Dron, J., & Anderson, T. (2007). Collectives, networks and groups in social software for e-learning. In *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (Vol. 16, 2008), Quebec.

Ebner, M. (2007, April 10–13). E-learning 2.0 = e-learning 1.0 + Web 2.0? In *Proceedings of the Second International Conference on Availability, Security and Reliability*, Vienna, Austria.

Hernández, D., Asensio, J. I., Dimitriadis, Y., & Villasclaras, E. D. (2011). Pattern languages for generating CSCL scripts: From a conceptual model to the design of a real situation. In P. Goodyear & S. Retalis (Eds.), *E-learning, design patterns and pattern languages*. Rotterdam: Sense Publishers.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Cambridge, MA: MIT Press.

Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century* (MacArthur Commissioned Report). Available online http://digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF. Accessed 11 Aug 2011

JISC. (2006). *Designing spaces for effective learning: A guide to 21st century learning space design*. Available online at http://www.jisc.ac.uk/eli_learningspaces.html. Accessed 6 Sept 2011.

Katz, R. (2008). The tower and the cloud: Higher Education in the age of cloud computing. *An Educause ebook*. Available online at http://net.educause.edu/ir/library/pdf/PUB7202.pdf. Accessed 11 Aug 2011.

Lankshear, C., & Knobel, M. (2006). Digital literacies: Policy, pedagogy and research considerations for education. *Nordic Journal of Digital Literacy, 1*(1), 226.

Lévy, P. (1997). *Collective intelligence: Mankind's emerging world in cyberspace* (R. Bononno, Trans.). Cambridge, MA: Perseus Books.

Mathes, A. (2004). Folksonomies – Cooperative classification and communication through shared metadata. *Computer Mediated Communication*. Available online at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.135.1000andrep=rep1andtype=pdf. Accessed 11 Aug 2011.

McAndrew, P., Godwin, S., & Santos, A. (2008). Identifying Web 2.0 learning in open educational resources. *Journal of Computer Assisted Learning* (special issue on Web 2.0 and learning: a revolutionary paradigm or a variation of CSCL).

NMC. (2012). *The horizon report* (2011 ed.). The New Media Consortium. Accessed 11 Aug 2011.

Nozuri, A. (2006). Folksonomies: (Un)controlled vocabulary? *Knowledge Organization, 33*(4), 199–203. Ergon Verlag. Available online at http://eprints.rclis.org/bitstream/10760/10307/1/Folksonomy%2c_UnControled_Vocabulary.pdf. Accessed 11 Aug 2011.

O'Reilly, T. (2004, January 7, 2011). *The architecture of participation.* Available online at http://www.oreillynet.com/pub/a/oreilly/tim/articles/architecture_of_participation.html. Accessed 11 Aug 2011.

O'Reilly, T. (2005). *What is Web 2.0 – Design patterns and business models for the next generation of software*. Available online at http://oreill,ynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-Web-20.html. Accessed 11 Aug 2011.

OECD. (2007). *Giving knowledge for free – The emergence of open educational resources*. Paris: OECD Centre for Educational Research and Innovation. Available online at http://www.oecd.org/dataoecd/35/7/38654317.pdf. Accessed 11 Aug 2011.

Okada, A., Shum, S. B., & Sherborne, T. (2008). *Knowledge cartography: Software tools and mapping techniques*. New York: Springer.

Redecker, C., Ala-Mutka, K., Bacigalupo, M., Ferrari, A., & Punie, Y. (2009). *Learning 2.0: The impact of Web 2.0 innovations in education and training in Europe*. Seville: Institute for Prospective Technological Studies. Available online at http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2899. Accessed 11 Aug 2011.

Rooney, P., Mac Namee, B. (2007, March 7–9). *Students @ play: Serious games for learning in Higher Education*. INTED2007 International Technology, Education and Development Conference, Valencia.

Seely Brown, J. (2006). New learning environments for the 21st century – Exploring the edge. *The Magazine of Higher Learning, 38*, 18–24.

Sharpe, R., Beetham, H., & De Freitas, S. (Eds.). (2010). *Rethinking learning for the digital age: How learners shape their own experiences*. London: Routledge.

Sharples, M., & Scanlon, E. (Eds.). (2011). *Final report: Personal inquiry (PI): Designing for evidence-based inquiry learning across formal and informal settings*. Nottingham: University of Nottingham.

Siemens, G. (2009, July 5). *Connectivism and connective knowledge 2009*, blog post. Available online at http://ltc.umanitoba.ca/connectivism/?p=189. Accessed 11 Aug 2011.

Sigala, M. (2007). Integrating Web 2.0 in e-learning environments: A socio-technical approach. *International Journal of Knowledge and Learning, 3*(6), 628–648.

Solove, D. J. (2004). *The digital person – Technology and privacy in the information age*. New York: New University Press.

Surowiecki, J. (2004). *The wisdom of the crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies and nations*. New York: Doubleday.

Virilio, P. (1998). *The information bomb*. London: Verso.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. Cambridge, MA: MIT Press.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity* (Learning in doing: Social, cognitive, and computational perspectives). Cambridge: Cambridge University Press.

Wills, G., Woukeu, A., Bailey, C., Carr, L., Conole, G., Hall, W., & Grange, S. (2004, June 21–26). Ontologically driven learning agreements. In *Proceedings of the Edmedia Conference*, Lugano, Switzerland.

Chapter 5
Mediating Artefacts

Introduction

This chapter will introduce the concept of mediating artefacts, which is one of the key principles underpinning the open learning design methodology described in this book. It will outline the background to the concept and give examples of the ways in which it can be used to understand the characteristics of technologies. It will describe how the origins of the concept are grounded in a sociocultural perspective and will discuss how it is used specifically in the area of learning design. Illustrative examples will be provided of the different mediating artefacts practitioners use to guide their design process.

The Origins of the Concept of Mediating Artefacts

The concept of mediating artefacts is very much grounded in a sociocultural perspective, linking back to the work of Vygotsky (1962, 1978), Leontiev (1978, 1989), and Luria (1976) and more recently the body of knowledge about activity theory (Cole et al. 1997; Daniels et al. 2007; Engeström 2001; Engeström et al. 1999).

Central to Vygotsky's ideas is the notion that social interactions play a fundamental role in the process of cognitive development. Vygotsky argued that what distinguishes humans from other animals is their use of speech in relation to practical activity (Vygotsky 1978). He argued that words can shape an activity into structure. He described the analogy of signs as tools. Signs can be used as a means of solving a given psychological problem (to remember, compare, report, choose, etc.), and he argued this is analogous to the use of tools. Therefore, signs act as an instrument of psychological activity in a manner analogous to the role of a tool in labour. He referred to this as subcategories of mediating artefacts (Fig. 5.1). He argued that a tool's function is to serve as a conductor of human influence on the object of activity, that is, it is externally orientated. Whereas a sign changes nothing in the object of

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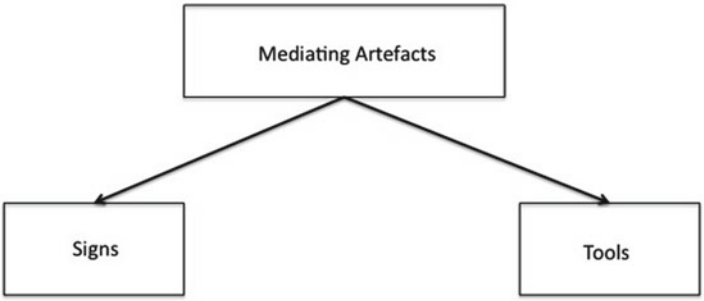

Fig. 5.1 Signs and tools as mediating artefacts

psychological operation, it is internally orientated. Therefore humans use tools that are developed from a culture, such as speech and writing, to mediate their social environment.

Figure 5.1 shows the two types of mediating artefacts, namely, tools and signs. A fundamental premise of Vygotsky's theory is that tools and signs are first and foremost shared between individuals in society, and only then can they be internalised by individuals. Vygotsky argued that:

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals. (Vygotsky 1978, p. 57)

Building on this, he introduced the concept of the 'zone of proximal development (ZPD)' which he defined as:

> We propose that an essential feature of learning is that it creates the zone of proximal development; that is, learning awakens a variety of internal development processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalised, they become part of the child's independent developmental achievement. (Vygotsky 1978, p. 90)

In other words, the zone of proximal development is the difference between what a learner can do without help and what they can do with help from others. The concept of scaffolding (Wood et al. 1976) builds on this idea and relates to the idea of the teacher providing scaffolding to the learner's ZPD, which is then faded over time as the learner becomes more competent.

Capturing and Representing Practice

Conole (2008) describes how the concept of mediating artefacts can be adapted and used in a learning design context. An important aspect of learning design is the process of eliciting a design describing the essence of a learning activity that can

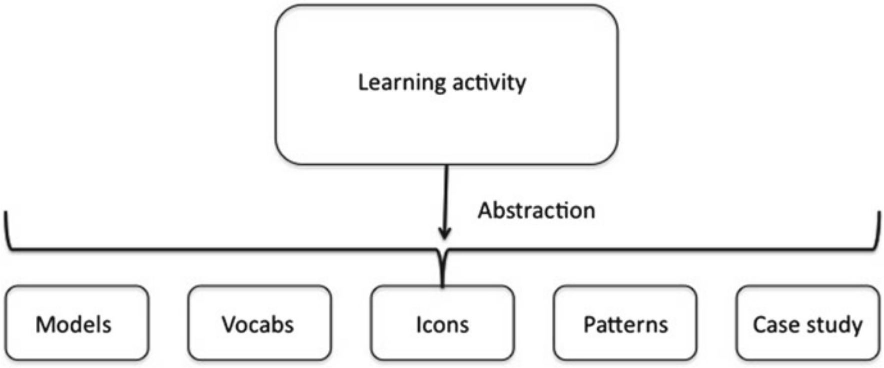

Fig. 5.2 The range of mediating artefacts that can be derived from a learning activity

then be reused in the development of a new learning activity. Central to this is the fact that we want to abstract the essential and transferable properties of learning activities, that is, we want to abstract and describe those properties that are effective, but that can also be applied to other contexts, those properties that are not context bound to a particular instance of activity.

Learning activities can be ‘codified’ into a number of different representations; each one foregrounds different aspects of the learning activity and provides a means of illustrating the inherent design underpinning the learning activity. These forms of representation are defined here as mediating artefacts because this emphasises their mediating role in terms of how they are used to mediate design activities. Course designers use a range of mediating artefacts (MAs) to support and guide decision-making, ranging from rich contextually located examples of good practice (case studies, guidelines, etc.) to more abstract forms of representation which distil out the ‘essences’ of good practice (models or patterns). In the context discussed here, I argue that mediating artefacts can be derived from existing learning activities by a process of abstraction (Fig. 5.2). The same learning activity (LA) can result in a range of abstractions:

- Textually based narrative case studies, describing the key features of the learning activity and perhaps barriers and enablers to its implementation
- More formal narratives against a specified formal methodology, such as a pedagogical patterns (Goodyear 2005; Goodyear and Retalis 2010)
- Visual representations, such as a mind map or formalised UML[1] use case diagram
- Vocabularies (Currier et al. 2005), such as taxonomies, ontologies or folksonomies
- Models (Conole 2010; Mayes and De Freitas 2004), foregrounding a particular pedagogical approach (such as instructivism, problem-based learning or an emphasis on a dialogic or reflective approach)

[1] http://www.uml.org/

Mediating artefacts help practitioners to make informed decisions and choices in order to undertake specific learning and teaching activities. They differ in a number of respects: (1) their format of presentation (textual, visual, auditory or multimedia), (2) their degree of contextualisation (ranging from abstract to fully contextualised), (3) the level of granularity (i.e. the amount of details available within the MA about the learning activity) and (4) the degree of structure (flat vocabularies versus typologies).

Examples of Mediating Artefacts

Narratives or case studies provide rich contextually located MAs, which are valuable in that they describe the details of a particular pedagogical intervention. The drawback is that because they are so contextually located, they may be difficult to adapt or repurpose. Pedagogical patterns provide a specifically structured means of describing practice, building on the work of the architect Alexander (1977; Alexander et al. 1977), by presenting the LA in terms of a problem to be solved; see, for example, Goodyear (2005) and Goodyear and Retalis (2010) and the Pedagogical Patterns Project.[2]

Vocabularies represent a more 'atomistic', text-based form of representation by describing the components involved in learning activities. Currier et al. (2005) provide a review of educational vocabularies to describe practice and curriculum design which goes beyond the description of resources, focusing at the level of learning activities. They consider the range of vocabularies that have been developed to describe practice, including an inventory of existing pedagogical vocabularies, such as flat lists, taxonomies, thesauri, ontologies and classification schemes. Conole (2008) articulates the components of a learning activity. These include the context within which the activity occurs (subject, level, etc.), intended learning outcomes associated with the activity mapped to Bloom's taxonomy (Anderson and Krathwohl 2001; Bloom 1956), the pedagogical approaches, the tasks the learners are required to do in order to achieve the learning outcomes and any associated assets and outputs (tools, resources, support or outputs). This has been adapted from a taxonomy developed in previous work (Conole 2007). Table 5.1 shows the components of the learning activity taxonomy. This includes a list of possible pedagogies, including approaches and techniques, as well as the tasks, tools, resources, support and outputs. This can be used as a checklist in the design process helping to identify and consider each of the components involved in a learning activity and serves to illustrate the variety of factors which constitute a learning activity, further demonstrating the complexities involved in the design process.

[2] http://www.pedagogicalpatterns.org/

Table 5.1 The learning activity taxonomy

Context	Learning outcome, subject, discipline, level, learner characteristics, prerequisites, time to complete							
Pedagogy		Tasks and supporting assets and outputs						
Approaches	Techniques	Tasks		Tools		Resources	Support	Outputs
Action research	Buzz words	Analyse	List	Bibliographic software	Powerpoint	Annotated bibliography	Buddying	Artefact
				Blogs				
Active learning	Crosswords	Apply	Listen	CAA tools	Project manager	Content in blogs	Coach	Assignment
Case study	Drill and practice	Argue	Manipulate	CD/DVD	Search engine	Content in wikis	Diagnostic test	Book report
Collaborative	Exercise	Brainstorm	Model	Chat	Simulation software	Course information	Explanation	Concept map
Conceptual	Experiment	Calculate	Negotiate	Concordancer	Spreadsheet	Course reading materials	Facilitation	Dissertation
Constructivist	Fishbowl	Classify	Observe	Database	Statistical software	Discussion forum content	Formative	Essay
Dialogic	Game	Compare	Order	Digital audio	Text image audio or video viewer	FAQs	Feedback	Paper
Enquiry-led	Ice breaker	Construct	Organise	Digital video	Video conferencing	Interactive CD ROM	Induction	Performance
Experiment	Journaling	Create	Practise	Discussion board	VLE/LMS	MCQ	Instructions	Portfolio
Field trip	Pair dialogues	Criticise	Predict	Electronic library	Virtual worlds	Previous cohort resources	Intervention	Presentation
Goal-based scenario	Panel discussion	Critique	Prepare	Email	Voice over IP	Schedule/course calendar	Monitoring	Product
Problem based	Peer exchange	Debate	Present	Graphic package	Voting system	Peer-generated resource	Orientation session	Report

(continued)

Table 5.1 (continued)

Context	Learning outcome, subject, discipline, level, learner characteristics, prerequisites, time to complete							
Pedagogy		Tasks and supporting assets and outputs						
Approaches	Techniques	Tasks		Tools		Resources	Support	Outputs
Procedural	Puzzles	Decide	Produce	Instant messaging	Wikis	Peer-recommended sites	Peer collaboration	Review
Project based	Question/answer	Define	Question	iPOD/MP3 player	Word processor	Subject-based websites	Peer reflection	
Reflective practitioner	Rounds	Demonstrate	React	Image software		Template	Scaffolding	
Resource based	Scavenger hunt	Describe	Read	Memory stick		Research journal articles	Set up	
Role play	Snowball	Design	Recite	Mind map		Grey literature	Surgery	
Vicarious learning	Structured debate	Differentiate	Refine	Modelling				
	Tutorial	Discover	Reflect	NVIVO				
	Web search	Discuss	Report	Online assessment				
		Draw	Research	Podcast				
		Evaluate	Resolve					
		Experience	Review					
		Explain	Search					
		Explore	Select					
		Gather	Simulate					
		Generalise	Solve					
		Hypothesise	Specify					
		Identify	State					
		Illustrate	Summarise					
		Infer	Synthesise					
		Interpret	Test					
		Interview	Translate					
		Investigate	View					
		Judge	Vote					
		Justify	Write					

Diagrammatic or iconic presentations are important as they give a quick overview of the key features of an activity. They are valuable in that they can emphasise different connections between aspects of the activity and give an indication of structure and a sense of flow or movement. Learning activities can be represented visually adopting a particular iconic representation (Botturi et al. 2006; Botturi and Stubbs 2008). Examples of these include the formal visual presentations used for Unified Modeling Language (UML)[3] use cases (see, e.g. Van Es and Koper 2006) or the approach adopted by the AUTC Learning Design project (Agostinho 2006; Agostinho et al. 2008). In the AUTC learning design representation, learning activities are broken down into a series of tasks which learners undertake; alongside these, associated resources and support are illustrated. In addition to this visual 'temporal sequences' for each learning activity, there is a rich range of additional information about the design process. As described in Chapter 8, we have developed a particular iconic representation that adopts a similar approach to these (Conole 2007; Conole et al. 2008) focusing on a set of tasks adopted by each 'role' in the learning activity and an associated set of resources and tools. Tools, resources and outputs associated with each task are shown alongside, with arrows indicating connections.

Models provide more abstract forms of representation. Simplistically, a model is an abstract representation that helps us understand something we cannot see or experience directly. Beetham considers a model to be 'a representation with a purpose' with an intended user and distinguishes five usages of the word: 'practice models or approaches', 'theoretical models', 'technical models', 'models for organisational change' and 'students' models' (Beetham 2004). Models are usually aligned to a particular pedagogical approach. Examples of learning models frequently used in e-learning include Kolb's learning cycle (Kolb 1984), Laurillard's conversational framework (Laurillard 2002), Salmon's e-moderating framework (Salmon 2003) and Wenger's community of practice model (Wenger 1998). See Chapter 14 and Conole (2010) for more details on these. Each emphasises different aspects of learning. Kolb presents an action-based or 'learning by doing' model through a four-stage cycle (experience, reflection, abstraction and experimentation). Laurillard describes the stages involved in the dialogic interaction between a learner and teacher, demonstrating the way in which concepts are internalised and adapted by each in the process. Salmon's five-stage framework for supporting effective e-moderating in discussion forums, emphasising the dialogic aspects of socially situated theoretical perspectives. Finally, although not originally developed for a learning context but now widely used in e-learning, Wenger's theory of communities of practice is valuable as it considers the ways in which communities of practice are formed, developed and fostered. He sees four main aspects: learning as community, learning as identity, learning as meaning and learning as practice. Therefore, each is valuable in that it helps to foreground particular aspects of learning, which can then be used to provide guidance.

[3] See http://www.objectmentor.com/resources/articles/usecases.pdf for more on UML case studies.

Understanding Learning Activities Through Mediating Artefacts

Using the concept of mediating artefacts enables us to foreground the different aspects of a learning activity that a particular representation highlights. MAs have different strengths, weakness and purposes, depending on the context of use and the configurations of their affordances[4] and their constraints. For example, narratives and case studies provide rich contextually located mediating artefacts that are valuable in that they describe the details of a particular pedagogical intervention. The drawback is that because they are so contextually located, they may be difficult to adapt or repurpose. Models and patterns provide more abstract forms of representation. However, because by their nature they are abstractions, practitioners may misunderstand how to effectively apply a model or pattern and hence as a result adopt a surface application of the model to their practice. Patterns are narratives but are grounded in a particular way of thinking which emphasises a problem-based approach to design.

Agostinho rightly notes that there is currently no consistent notation system for learning design (Agostinho 2006). The Mod4L project[5] identified a range of representations that practitioners use to represent practice (Falconer and Littlejohn 2006), including taxonomies and matrices, visual presentations (flow diagrams, mind maps), case studies and lesson plans. The project used these with practitioners in a series of workshops to identify their usage and perceived value. They concluded that use is complex and contextualised and that no one presentation is adequate. This aligns with the arguments being made here; by identifying and labelling mediating artefacts, we are able to understand how learning activities are being represented and how these artefacts might be then used in a mediation role to guide new design.

Meta-mediating Artefacts

Figure 5.3 shows how existing learning activities can be repurposed to create a new learning activity. The essence of a LA is abstracted into a MA; different MAs highlight or foreground different aspects of the LA. Mediating artefacts can also be aggregated to provide more structured or scaffolded support, for example, in the form of interactive toolkits, planners or repositories (e.g. a library of cases studies). So, for example, a model, case study or pattern can become part of a repository, which may consist of similar examples or might be a mixture of models, case studies and patterns. Case studies and models might be combined with some supporting text to form a pedagogical planner or an interactive toolkit. Video clips, case studies, models and patterns might be reviewed and key points synthesised and put into a set of tips and hints or guidelines. Lever (2006) discusses a

[4] The concept of affordances is described in Chapter 6.

[5] http://www.academy.gcal.ac.uk/mod4l/

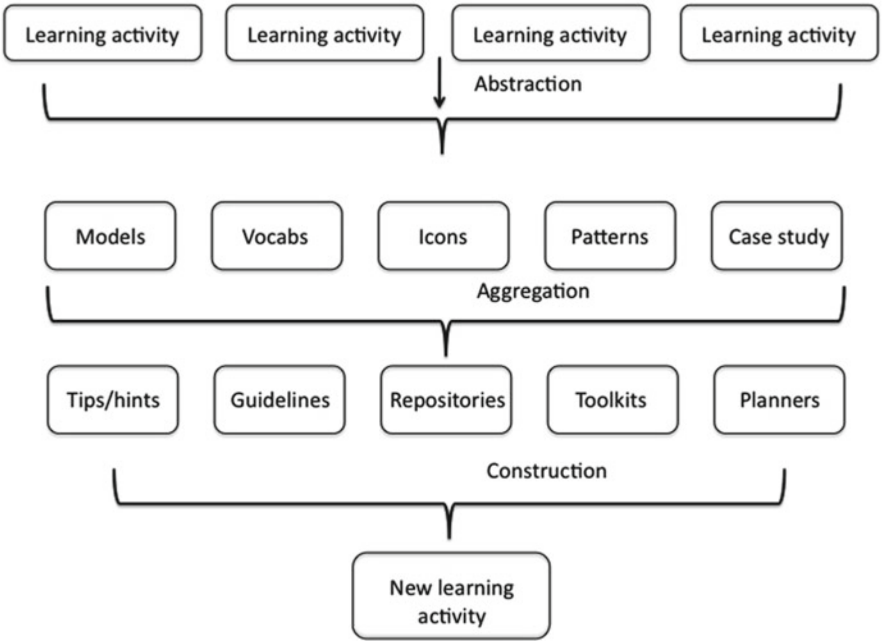

Fig. 5.3 Mediating artefacts, meta-mediating artefacts—abstraction, aggregation and construction

range of different meta-mediating artefacts and compares seven examples, which he terms 'educational galleries': Contemporary Online Teaching Cases (COTC),[6] Designing Electronic Learning and Teaching Approaches (DELTA),[7] designshop (DS),[8] DialogPlus Toolkit (DPT),[9] Learning Designs (LD),[10] Teach with Technology (TwT)[11] and UMUC-Verizon Virtual resource site for teaching with technology (UMUC).[12] Figure 5.3 illustrates the role of mediating artefacts and meta-mediating artefacts in the design of a new learning activity. It shows how a new LA can be constructed either from an individual mediating artefacts (such as a case study, model or iconic representation) or from a meta-mediating artefact (such as a toolkit). The figure illustrates the process of abstracting learning activities into mediating artefacts that can then be used in the construction of a new learning activity.

[6] http://www.deakin.edu.au/itl/teach-learn/cases/

[7] http://Webct.med.monash.edu.au/muso.html

[8] http://www.edtech.vt.edu/edtech/id/index.html

[9] http://www.nettle.soton.ac.uk/toolkit/

[10] http://learningdesigns.uow.edu.au/

[11] http://dmc.umn.edu/teach.shtml

[12] http://www.umuc.edu/virtualteaching/

Therefore, mediating artefacts can be aggregated into meta-mediating artefacts of three main kinds:

- Aggregates. The first type consists of aggregates of example MAs, for example, repositories of case studies, patterns or models or a combined repository containing a mixture of all three.
- Scaffolds. The second type consists of scaffolds of some kind that synthesise key points and issues, for example, tips and hints or guidelines.
- Mixed. The third type consists of a mixture of example MAs and scaffolds or supporting text, such as toolkits and pedagogical planners (as discussed in Chapter 10).

Examples of meta-mediating artefacts associated with learning activities and learning design include the following:

- OTIS repository of case studies[13]
- E-learning centre library of case studies[14]
- Series of effective practice guides and case studies produced by JISC,[15] which synthesise key features across their development programmes
- AUTC learning design website[16]
- MERLOT database of resources and associated support[17]

This section has argued that by defining forms of representation which aim to describe aspects of a learning activity as mediating artefacts, this helps to foreground what each MA offers, ground this in a sociocultural perspective emphasising the mediational role of such artefacts in the design process and contextualising this alongside other aspects involved, and enables us to see the full cycle of abstraction and construction of learning activities and how mediating artefacts are used in the process.

Activity Theory

The concept of mediating artefacts as described in this chapter derives from a sociocultural perspective. This perspective recognises that learning activities are contextually bound. Use of an activity theory lens is valuable as it helps to highlight the relationship between the different components involved in the design process, as well as the context within which it takes place.

Kaptelinin and Nardi provide a comprehensive overview of activity theory and its origins (Kaptelinin and Nardi 2006). (Also see Cole and Engeström 1993; Daniels et al. 2007; Engeström 2001; Engeström et al. 1999; Kutti 1996; Nardi 1995;

13 http://otis.scotcit.ac.uk/

14 http://www.e-learningcentre.co.uk/eclipse/Resources/casestudies.htm

15 http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_practice.aspx

16 http://www.learningdesigns.uow.edu.au/

17 http://www.merlot.org

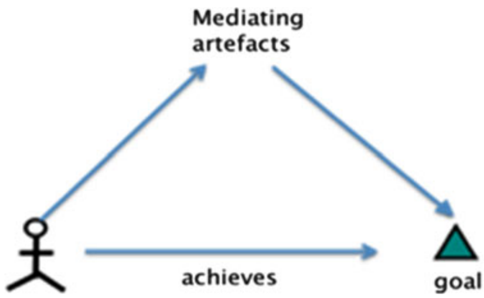

Fig. 5.4 Representation of the relationship between mediating artefacts, the use and the intended goal

Wertsch 1991). A key idea in Cultural Historical Activity Theory (CHAT) is the notion of mediation by artefacts (Kutti 1996), which are broadly defined to include instruments, signs, language and machines (Nardi 1995).

Mediating artefacts can support learners and teachers in making the best use of tools and resources. They mediate between the user and the end goal, as illustrated in Fig. 5.4. They enable the user to elicit and represent the inherent designs associated with a particular learning activity or resource. The vision is that if these designs can be abstracted and represented in a meaningful and understandable way, there is a greater chance of them being picked up, used and adapted by others, which, in turn, over time, is likely to lead to an evolving understanding of how new tools and resources can be used.

Figure 5.5 locates a mediating artefact within a CHAT framework. The subject is the designer involved in creating a learning activity. The object therefore is the motivation to design a learning activity and the outcome is the designed learning activity. The process can be mediated by a range of mediating artefacts as described earlier. The use of CHAT enables us to describe the context within which this process occurs. The design process will involve a number of roles (division of labour). At the simplest level, this may consist of an individual teacher working alone to create a learning activity. However, the design process may be team based, in which case different individuals might adopt different roles (e-learning advisor, facilitator, evaluator, etc.) or it might be a teacher working in conjunction with an educational developer or an instructional designer. The rules help to contextualise the creation of the learning activity. They include rules and constraints that bound the design process—for example, the institutional context, professional constraints and requirements, local practices and processes. Finally, the community node helps to identify the range of dialogic mechanisms that are used in the design process. These are important because they provide the designer with flexibility as they provide an opportunity to clarify and discuss issues around the creation of a learning activity in further detail. In a series of interviews with course designers, this dialogic process was cited as one of the most important mechanisms for guiding practice. See Cross et al. (2008) and Wilson (2007) for a description of these case studies.

The learning activity produced as a result of this process can then be represented in a number of different forms of representations that can in turn act as mediating artefacts in the creation of new learning activities (Fig. 5.6). The CHAT triangle on

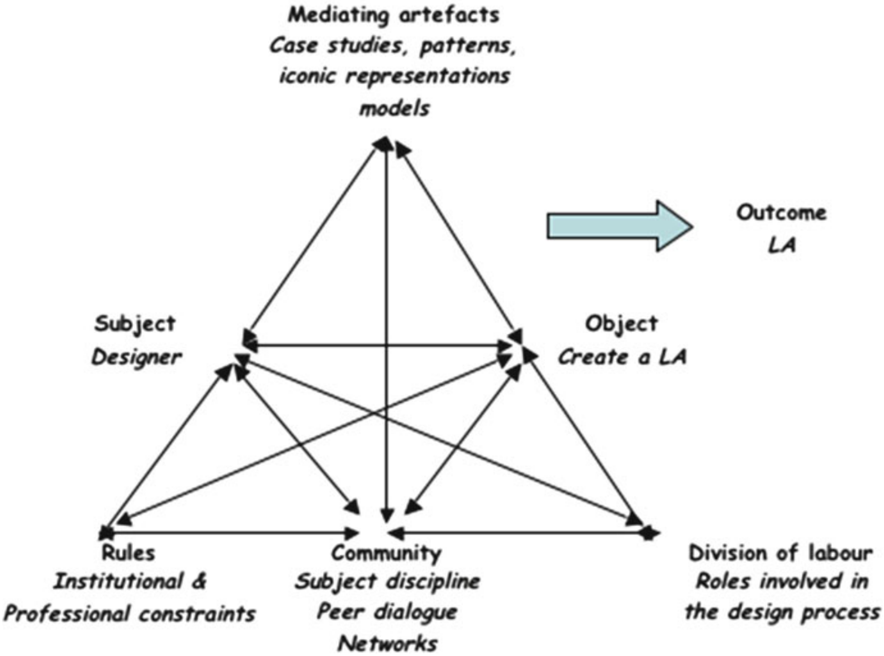

Fig. 5.5 An activity theory representation of the learning design process

the left illustrates the creation of a learning activity LA_1 using a mediating artefact MA_1. The learning activity, LA_1, can then be represented in a number of forms of representation (MA_2, MA_3 and MA_4—which might be narrative cases studies, an iconic representation, a video clip or a schematic model), which are in turn used as starting points in the creation of new learning activities (LA_2, LA_3 and LA_4).

An Illustrative Example of the Application of This Approach

This section will show how learning design, pedagogical patterns and open educational resources can be used together in the deconstruction and reconstruction of a resource. There are essentially four different types of mediating artefacts: learning design visualisation tools, learning design methods, pedagogical patterns and Web 2.0 sharing and discussion tools (Fig. 5.7).

The following scenario provides an example of how this might work in practice (Fig. 5.8). It describes the creation of an OER and an associated design for the OER and shows how this can be repurposed in three different ways. Tools and resources from OER, learning design and pedagogical patterns research are used to help design the original OER and then to share and repurpose it.

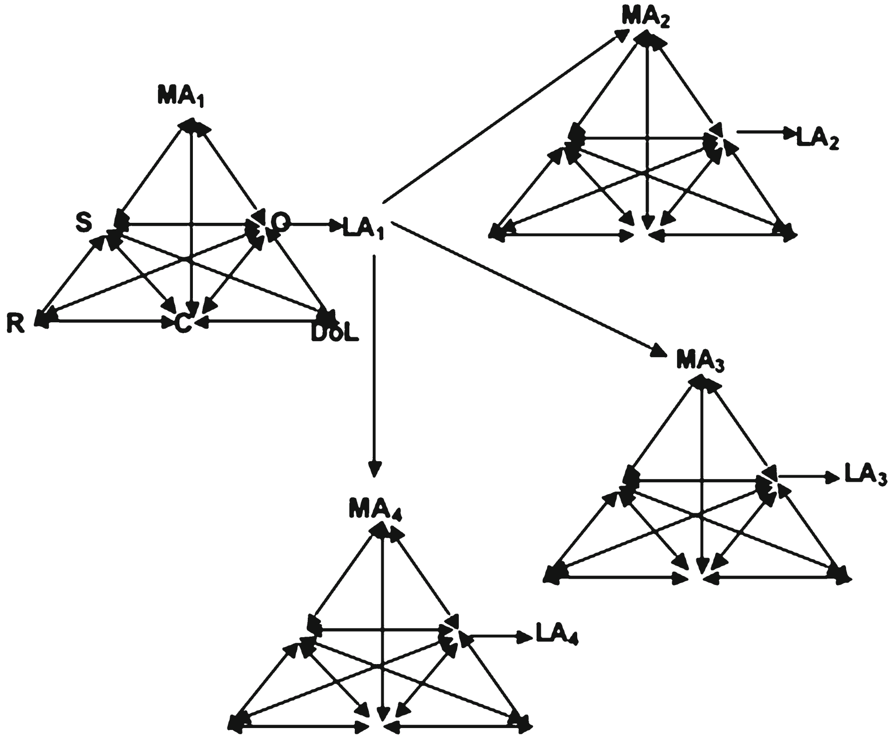

Fig. 5.6 Repurposing a learning activity via a range of mediating artefacts

Teacher A: The Design Phase

The scenario begins with teacher A. The context is that teacher A is putting together their beginners' level Spanish material for an OU course, Portales, L194. They make the material available as an OER online in the OpenLearn repository.[18] They use the CompendiumLD tool for visualisation to articulate different ways in which they think the materials can be used. Chapter 9 discusses CompendiumLD in more detail. Figure 5.9 shows part of the visual design, including the branching sequence to enable a beginner and more advanced route through the learning materials. In particular, they are interested in showing how the materials can be used as both a revision exercise for an individual learner and at a more advanced level for a group of learners working collaboratively. Whilst developing their design in CompendiumLD, teacher A had access to ideas and tips and hints from the Cloudworks[19] social networking site for learning and teaching, as well as from a range of OER and

[18] http://openlearn.open.ac.uk/course/view.php?id=2439

[19] http://cloudworks.ac.uk

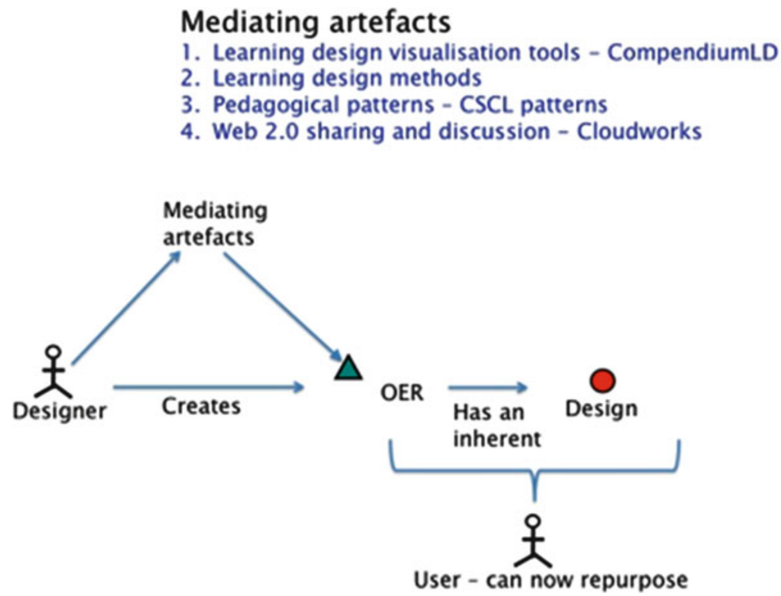

Fig. 5.7 Types of mediating artefacts

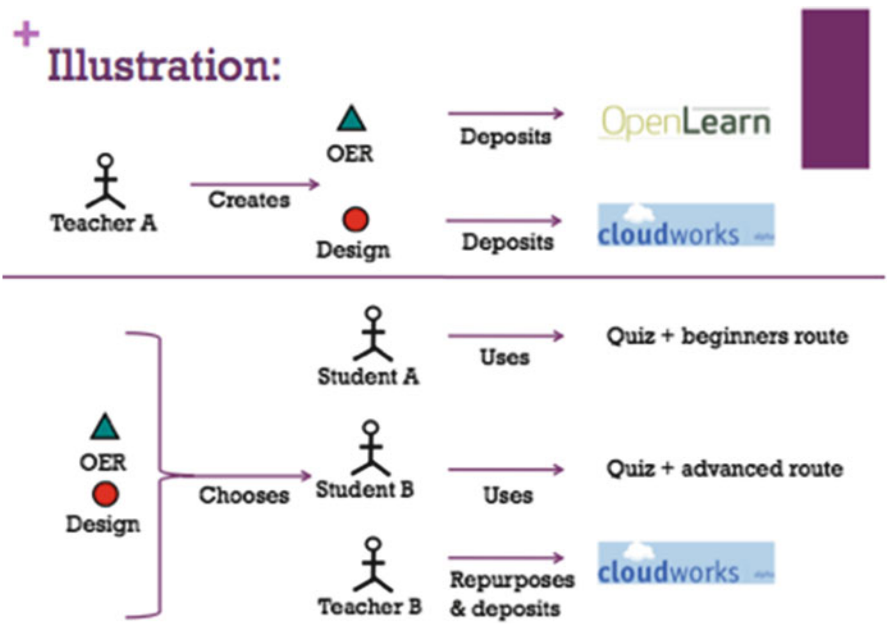

Fig. 5.8 A life cycle showing the design and reuse of an OER

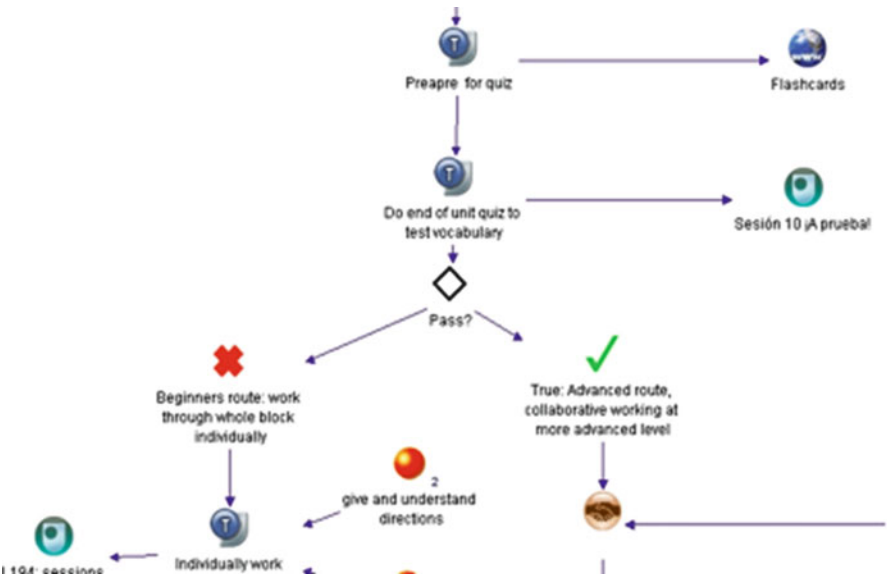

Fig. 5.9 Part of the design sequence created using CompendiumLD

pedagogical pattern repositories. Chapter 15 discusses Cloudworks in more detail. These help them to refine their design thinking, to get ideas about how to structure activities in the sequences and suggestions of tools that can be used, for example, for supporting a diagnostic e-assessment test or to enable students to communicate synchronously.

Learner A: Use Scenario 1—Beginners' Route

Learner A is studying Spanish. They are a few weeks into a beginner-level Spanish course. The topic they are currently working on is 'describing places'; they are looking for freely available tools or resources that might help; they are also interested in finding study buddies to work with, who are at a similar level:

1. They explore the OpenLearn site.
2. They find the set of OERs for a beginners' Spanish course—L194—Portales[20] from the Open University, UK, developed by teacher A.
3. They find, alongside these resources, the visual design—which provides an example of how these resources might be used. The design consists of the following aspects:
   (a) A diagnostic e-assessment test to assess their level of understanding of the topics covered in the course.

[20] http://openlearn.open.ac.uk/course/view.php?id=2439

(b) Two potential pathways: (1) a beginners' route where the learner works individually through the L194 OER material and (2) an advanced route where the learner is assigned to a study group to work collaboratively around one aspect of the L194 OER material, activity 2.1. In this advanced route, the existing activity (categorise three pictures of buildings as Latin American or Spanish) is replaced with one where the learner has to describe and compare the buildings, working collaboratively with other students and interrogating an expert for information. The activity exploits the jigsaw pedagogical pattern (Hernández-Leo et al. 2006) and also uses a free video conferencing tool to enable the study group to speak with a Spanish cultural expert.

4. They take the diagnostic tests and the advice is that they should take the beginners' route and complete the L194 OER material.

Learner B: Use Scenario 2—Advanced Route

Learner B is a student a few weeks into an intermediate-level Spanish course. They work through a similar set of activities to learner A, but in this case, after taking the diagnostic test, the advice is that they take the advanced route, to focus on the adapted activity 2.1 as a collaborative exercise with other students.

Teacher B: Use Scenario 3—Repurposes

Teacher B is an associate lecturer teaching on the intermediate-level Spanish course at the Open University, En Rumbo—L140, preparing for a face-to-face tutorial with their students. The topic is describing places. They find the design described above and adapt it to produce two new variants of the design. (1) A classroom-based activity, where the students describe the pictures using the think-pair-share pedagogical pattern (Hernández-Leo et al. 2006). (2) A similar exercise in terms of comparing three buildings, but the students are asked to describe buildings from their town and then talk online with an expert (a student in Spain), who describes their home town. The activity is set as a precursor to the first assignment exercise for the course.

Figure 5.10 provides a conceptual overview and generalisation of this scenario—showing how an initial design can query existing resources such as Cloudworks, pedagogical pattern repositories and OER repositories, such as OpenLearn, use these to help create and populate an OER, along with an associated design, which can then be deposited back into sites such as Cloudworks and OpenLearn for reuse.

In order to test our approach, a number of workshops were held between May and June 2009. Evaluation of these indicated that while determining the pattern of an OER by considering the end product is difficult, the adoption of these collaborative patterns is relatively simple and leads to new views on how OER content can be used. Typically, this extends the likely effort of the user and increases the potential

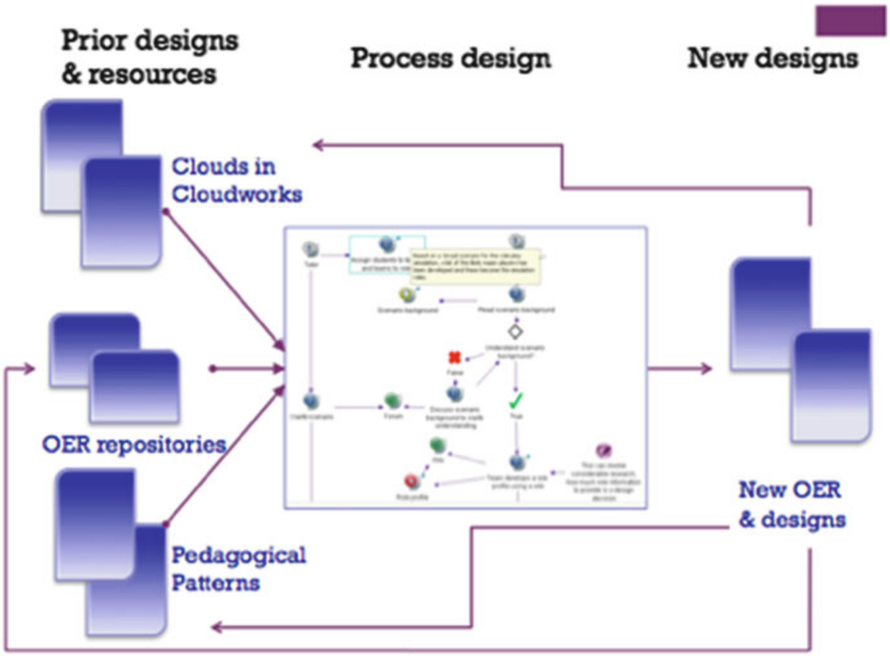

Fig. 5.10 The OER design cycle

for learning from the content without rewriting the core material. This chapter has shown how design presentations, along with a small number of collaborative patterns, can be used to guide rethinking how an OER works and help repurpose the OER to incorporate more collaboration and adaptability. Further aspects of evaluation of these workshops and analyses of the results are reported elsewhere (Conole et al. 2010; Dimitriadis et al. 2009).

Conclusion

As discussed at the start of this book, the mismatch between the potential of technologies and actual use in practice is one of the most important key challenges facing modern education. Focusing on improving design practices is likely to be one of the most effective ways of bridging this gap.

This chapter has described how the concept of mediating artefacts, derived from CHAT, can be applied to a learning design context. It has shown how this theoretical framework can be used to understand the different ways in which learning activities can be represented and the ways in which mediating artefacts can be used to support the design process. The chapter argues that articulating the nature of different mediating artefacts helps clarify the ways in which each represents different aspects of learning activities. The chapter has described the range of mediating artefacts that are commonly used by practitioners, highlighting their different uses. The difficulty of accurately capturing and rarefying practice in this way has been discussed. Overall, the chapter has attempted to demonstrate the complexity behind the deceptively simple questions: How can practitioners capture and represent learning activities? How can we provide scaffolding to support the design process? It offers a theoretical framework for addressing these questions using the concept of mediating artefacts as the conduit for both abstracting practice from existing learning activities and constructing new learning activities.

References

Agostinho, S. (2006, December 3–6). The use of visual learning design representation to document and communicate teaching ideas. In *Proceedings of the ASCILITE Conference*, Sydney. Available online at http://www.ascilite.org.au/conferences/sydney06/proceeding/pdf_papers/p173.pdf. Accessed 11 Aug 2011.

Agostinho, S., Harper, B., Oliver, R., Hedberg, J., & Wills, S. (2008). A visual learning design representation to facilitate dissemination and reuse of innovative pedagogical strategies in university teaching. In L. Botturi & S. T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 380–393). Hershey/New York: Information Science Reference.

Alexander, C. (1977). *Pattern languages*. New York: Oxford University Press.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction* (Vol. 2). Oxford: Oxford University Press.

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching and assessment: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

Beetham, H. (2004). *Review: Developing e-learning models for the JISC practitioner community* (A Report for the JISC E-pedagogy Programme, JISC). Available online at http://www.jisc.ac.uk/elp_designlearn.html. Accessed 11 Aug 2011.

Bloom, B. S. (1956). *Taxonomy of educational objectives, the classification of educational goals: Handbook 1 – Cognitive domain*. New York: McKay.

Botturi, L., & Stubbs, T. (2008). *Handbook of visual languages for instructional design: Theories and practices*. Hershey: IGI Global.

Botturi, L., Derntl, M., Boot, E., & Figl, K. (2006, July 5–7). A classification framework for educational modelling languages in instructional design. In *Proceedings of the ICALT Conference,* Kerkrade, The Netherlands.

Cole, M., & Engeström, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed cognition – Psychological and educational considerations*. Cambridge: Cambridge University Press.

Cole, M., Engeström, Y., & Vasquez, O. A. (1997). *Mind, culture and activity: Seminal papers from the laboratory of comparative human cognition*. Cambridge: Cambridge University Press.

Conole, G. (2007). Describing learning activities: Tools and resources to guide practice. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning*. Oxford: Routledge.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hershey: IGI Global.

Conole, G. (2010). *Review of pedagogical frameworks and models and their use in e-learning*. Available online at http://cloudworks.ac.uk/cloud/view/2982. Accessed 11 Aug 2011.

Conole, G., Brasher, A., Cross, S., Weller, M., Clark, P., & White, J. (2008). Visualising learning design to foster and support good practice and creativity. *Educational Media International, 54*(3), 177–194.

Conole, G., McAndrew, P., & Dimitriadis, Y. (2010). The role of CSCL pedagogical patterns as mediating artefacts for repurposing open educational resources. In F. Pozzi & D. Persico (Eds.), *Techniques for fostering collaboration in online learning communities: Theoretical and practical*. Hershey: IGI Global.

Cross, S., Conole, G., Clark, P., Brasher, A., & Weller, M. (2008, July 25). *Mapping a landscape of learning design: Identifying key trends in current practice at the Open University*. LAMS Conference, Cadiz, Spain.

Currier, S., Campbell, L., & Beetham, H. (2005). *JISC pedagogical vocabularies project – Report 1: Pedagogical vocabularies review*. London: JISC. http://www.jisc.ac.uk/uploaded_documents/PedVocab_VocabsReport_v0p11.doc. Accessed 11 Aug 2011.

Daniels, H., Cole, M., & Wertsch, J. V. (2007). *The Cambridge companion to Vygotsky*. Cambridge: Cambridge University Press.

Dimitriadis, Y., McAndrew, P., Conole, G., & Makriyannis, E. (2009, December 7–9). New design approaches to repurposing open educational resources for collaborative learning using mediating artefacts. In *Proceedings of the ASCILITE Conference*, Auckland. Available online at http://www.ascilite.org.au/conferences/auckland09/?m=Programmeands=Programme. Accessed 11 Aug 2011.

Engeström, Y. (2001). Expansive learning at work: Toward an activity-theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133–156.

Engeström, Y., Punamäki-Gitai, R. L., & Miettinen, R. (1999). *Perspectives on activity theory*. Cambridge: Cambridge University Press.

Falconer, I., & Littlejohn, A. (2006). *Mod4L report: Case studies, exemplars and learning designs* (Report of the JISC Mod4L Project). Glasgow: Glasgow Caledonian University. Available online at http://mod4l.com/tiki-download_file.php?fileId=2. Accessed 11 Aug 2011.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology, 21*(1), 82–101.

Goodyear, P., & Retalis, S. (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers.

Hernández-Leo, D., Villasclaras-Fernández, E. D., Ascensio-Pérez, J., Dimitriadis, I., Jorrín-Abellán, I. M., Ruiz-Requies, I., & Rubia-Avi, B. (2006). COLLAGE: A collaborative learning design editor based on patterns. *Educational Technology and Society, 9*(1), 58–71.

Kaptelinin, V., & Nardi, B. (2006). Activity theory in a nutshell, acting with technology. In V. Kaptenlinin & B. Nardi (Eds.), *Activity theory and interaction design* (pp. 29–72). Cambridge, MA: MIT Press.

Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs: Prentice Hall.

Kutti, K. (1996). Activity theory as potential framework for human computer interaction research. In B. Nardi (Ed.), *Context and consciousness: Activity and human-computer interaction*. London: MIT Press.

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.). London: RoutledgeFalmer.

Leontiev, A. N. (1978). *Activity, consciousness and personality*. Englewood Cliff/New York: Prentice Hall.

Leontiev, A. N. (1989). The problem of activity in the history of Soviet psychology. *Soviet Psychology, 27*(1), 22–39.

Lever, T. (2006, December 3–6). Who's designing for whom? Comparing taxonomies in web-based educational design galleries. In *Proceedings of the ASCILITE Conference*, Sydney. Available online at http://www.ascilite.org.au/conferences/sydney06/proceeding/pdf_papers/p144.pdf. Accessed 11 Aug 2011.

Luria, A. (1976). *Cognitive development: Its cultural and social foundations*. Harvard: Harvard University Press.

Mayes, T., & De Freitas, S. (2004). Review of e-learning frameworks, models and theories. *JISC e-Learning Models Desk Study*. Available online at http://www.jisc.ac.uk/uploaded_documents/Stage%202%20Learning%20Models%20(Version%201).pdf. Accessed 11 Aug 2011.

Nardi, B. (1995). *Context and consciousness: Activity and human-computer interaction*. London: MIT Press.

Salmon, G. (2003). *E-moderating – The key to teaching and learning on line* (2nd ed.). London: Koan Page.

Van Es, R., & Koper, R. (2006). Testing the pedagogical expressiveness of IMD LD. *Education, Technology and Society, 9*(1), 229–249. Available online at http://www.ifets.info/journals/9_1/19.pdf. Accessed 20 Sept 2011.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in society, the development of higher psychological processes*. Oxford: Harvard University Press.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity* (Learning in doing: Social, cognitive, and computational perspectives). Cambridge: Cambridge University Press.

Wertsch, J. V. (1991). *Voices of the mind. A sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Wilson, P. (2007). *Progress report on capturing e-learning case studies* (Internal Report). Milton Keynes: The Open University.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychiatry and Psychology, 17*(2), 89–100.

Chapter 6
Affordances

Introduction

This chapter will define the term ‘affordance’, starting from its original use in an ecological context, through to its use in human-computer interactions (HCI). It will then consider how the term can be used to describe the characteristics of technologies, along with illustrative examples. Although the term is contested,[1] I will argue that it is valuable in that it describes the ways in which the inherent characteristics of different technologies can be instantiated in different contexts and through the different preferences of individuals and how they interact with technologies. The chapter will describe how the term ‘affordances’ can be used to help develop a better understanding of the characteristics of different technologies and inform design decisions.

Definitions of the Term

Gibson (1977, 1979) defined the term ‘affordances’, in an ecological context, in relation to visual perception. He argued that affordances in an environment always lead to some course of action. Affordances are perceived by an individual and are culturally based. Gaver (1991) argues that the actual perception of affordances will be in part determined by the observer’s culture, social setting, experience and intentions. For example, a button has an affordance of pushing, a knob is for turning and handles are for pushing. Gibson (1977) defined affordances as:

> All ‘action possibilities’ latent in the environment, objectively measurable and independent of the individual’s ability to recognize them, but always in relation to the actor and therefore dependent on their capabilities. (Gibson 1977, pp. 67–82)

[1] See later discussions referencing Boyle and Cook, Gaver, Norman and McGrenere and Ho in this chapter.

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For example, a tall tree has the affordance of food for a giraffe because it has a long neck, but not for a sheep, or a set of stairs has an affordance of climbing for a walking adult, but not for a crawling infant. Therefore, affordances are always in relation to individuals and their capabilities; this includes the individual's past experience, values, beliefs, skills and perceptions. Therefore, a button may not have the affordance of pushing if an individual has no cultural context or understanding of the notion of buttons or related objects and what they are for. Gibson also argued that:

> The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. (Gibson 1979, p. 127)

He goes on to argue that it implies a complementarity between the animal and the environment. Salomon describes Gibson's concept of affordances as follows:

> 'Affordance' refers to the perceived and actual properties of a thing, primarily those functional properties that determine just how the thing could possibly be used. (Salomon 1993, p. 51)

Therefore, affordances are properties of the world that are compatible with and relevant for people's actions (Gaver 1991). Weiser and Seely Brown (1995) offer the following definition:

> An affordance is a relationship between an object in the world and the intentions, perceptions, and capabilities of a person. The side of a door that only pushes out affords this action by offering a flat pushplate. The idea of affordance, powerful as it is, tends to describe the surface of a design. For us the term 'affordance' does not reach far enough into the periphery where a design must be attuned to but not attended to.

McGrenere and Ho identify three properties of affordances (McGrenere and Ho 2000):

1. An affordance exists relative to the action capabilities of a particular actor.
2. The existence of an affordance is independent of the actor's ability to perceive it.
3. An affordance does not change as the needs and goals of the actor change.

The term was adapted by Norman (1988, 1998) for use in an HCI context. His interest was in how the affordances of everyday objects could either enhance or restrict their accessibility. He was interested in using the concept to support the better design of objects to accomplish particular functions. Norman (1988) said:

> When used in this sense, the term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used. A chair affords ('is for') support and, therefore, affords sitting.

Norman was interested in design and in particular with making affordances salient so that users could easily perceive them. McGrenere and Ho (2000) distinguish between the utility of an object (i.e. the actions it affords for the user) from the usability of the object (i.e. the perceptual information that signals its affordances). Norman considers both perceived and actual properties and implies that a perceived property may or may not be an actual property, but regardless, it is an affordance. Thus, he deviates from Gibson in that perception by an individual may be involved in characterising the existence of the affordance.

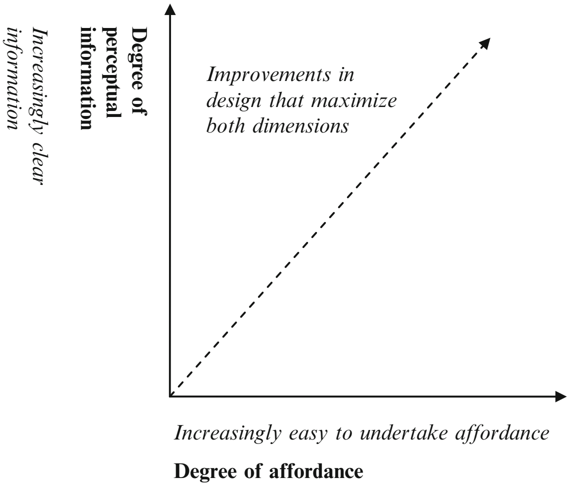

Fig. 6.1 McGrenere and Ho's diagram representing the affordance and the information that specifies the affordance as a continuum

Table 6.1 McGrenere and Ho's distinction between Gibson's and Norman's use of the term 'affordances'

Gibson's affordances	Norman's affordances
Action possibilities in the environment in relation to the action capabilities of an actor	Perceived properties that may not actually exist
Independent of the actor's experience, knowledge, culture or ability to perceive	Suggestions or clues as to how to use the properties
Existence is binary—an affordance exists or it does not exist	Can be dependent on the experience, knowledge or culture of the actor
	Can make an action difficult or easy

Gaver (1991) identifies three types of affordances: perceptible, hidden and false. Perceptible affordances are those where there is perceptual information for the affordance. Hidden affordances are those where there is no information for the affordance (e.g. a hidden door in a panel). Finally, false affordances are those which can result in a false action.

For Gibson, affordances are binary; they either exist or they do not. In contrast, McGrenere and Ho (2000) consider affordances in terms of two dimensions: (1) the ease with which an affordance can be undertaken and (2) the clarity of the information that describes the existing affordance, each being a continuum. They state that the goal of design is to first maximise the necessary affordances and then maximum each of these dimensions (Fig. 6.1).

McGrenere and Ho's article (2000) goes some way towards articulating the different uses of the term by Gibson and Norman. Table 6.1 summarises the main differences they identified. Boyle and Cook (2004), responding to Conole and Dyke's (2004a) use of the term 'affordances' in a technological context, argue that although the term 'affordances' is potentially rich, it is also contested. Drawing on McGrenere and Ho (2000), they argue that there is considerable ambiguity and confusion in the use of the term. Conole and Dyke (2004b) provide a justification for their use of the term and whilst I agree there is ambiguity, I would argue that the use of affordances as a means of describing the relationship between technologies and users and in particular resultant actions is useful.

Drawing on this work, Soegaard (2010) argues that clarifying:

> The distinction between Gibson's and Norman's sense of affordances allows us to distinguish between the utility/usefulness and the usability of an object. We both design for usefulness by creating affordances (the possibilities for action in the design) that match the goals of the user (the relativity of the affordance vis-à-vis the user) and we improve the usability by designing the information that specifies the affordances (perceptual information as shadows on buttons to afford clickability etc.).

The next section will consider the types of affordances of technologies and provide examples of how they can be used as a means of guiding the design of a learning intervention.

ICT Affordances

Edelson et al. (1999) cite Blumenfeld et al. (1991), who identified six contributions that technology can make to the learning process: (1) enhancing interest and motivation, (2) providing access to information, (3) allowing active manipulable representations, (4) structuring the process with tactical and strategic support, (5) diagnosing and correcting errors and (6) managing complexity and aiding production. Technologies provide a mechanism for storing and manipulating large quantities of information, presenting information in a variety of ways, allowing users to interact with materials and enabling learners to communicate with others to develop their understanding.

Specifically, in relation to information and communication technologies (ICT), Conole and Dyke (2004a) propose the following types of ICT affordances: accessibility, speed of change, diversity, communication and collaboration, reflection, multimodel and non-linear, risk, fragility and uncertainty, immediacy, monopolisation and surveillance. They argue that the taxonomy has a number of uses. Firstly, that establishing a clearer understanding of the affordances should help to inform practitioners in their use of technologies to achieve particular goals. Secondly, that it can also help to identify potential limitations and inappropriate uses of the technologies. Thirdly, by making the inherent affordances of technologies explicit, the taxonomy can act as a discussion point for critique and further refinement. Fourthly, it can be used as a checklist to help practitioners understand the advantages and disadvantages of different technologies. Fifthly, it can be used as a mechanism for staff development and improving practice—for example, by providing a checklist of potential benefits and drawbacks of different technologies which can be used to inform choice and the ways that practitioners might choose to use them. Similarly, Gaver (1991) argues that affordances can be used as a way of focusing on the strengths and weaknesses of technologies with respect to the possibilities they offer the people that might use them.

Conole and Dyke (2004a) were interested in exploring the relationship between the infrastructure of information and communication technologies and people's use of those technologies. In particular, what uses do technologies invite and facilitate, and in which ways can they be used to promote particular types of learning? They were interested in exploring the creative and innovative ways in which people respond to technologies.

Whilst Conole and Dyke's classification is useful in terms of describing ICT and how they can be used, on reflection I now feel that not all of them are affordances in the Gibsonian sense. More recently, I have identified a set of positive affordances, specifically in relation to the use of technologies in the design of learning interventions, as well as a list of constraints. Positive affordances include collaboration, reflection, interaction, dialogue, creativity, organisation, inquiry and authenticity. Constraints include time consuming (in terms of development), time consuming (in terms of support), difficult to use, costly to produce, assessment issues, lack of interactivity and difficult to navigate. I will now go on to describe each of positive affordances in turn and give examples of technologies that support them and will then briefly discuss the pragmatic constraints that need to be addressed.

Identification of the positive affordances of technologies and any associated constraints can then be used as a means of making informed design decisions in terms of using a particular technology in a specific learning context. For example, to promote student reflection, the affordances checklist can be used in terms of considering the extent to which different tools might promote this. So, for example, a wiki in this context has the following positive affordance: reflection (to an extent); however, arguably, a blog has a stronger affordance of reflection and is also better in terms of organisation and dialogue (as if the blog is public others are able to comment on posts). In terms of constraints, a wiki is arguably somewhat difficult to use for some learners anyway. Therefore, the checklist might result in the teacher deciding to use a blog rather than a wiki in this context.

At part of the OULDI work, we have developed an activity based around affordances, which we have used in a number of our learning design workshops.[2] Participants are given the list of positive affordances and constraints and asked to map these to a number of tools for use in a particular learning context. Participants found focusing on the affordances of the different tools a useful way of thinking about their advantages and disadvantages. It helped them focus on the actual use of a tool in a particular context rather than the tool per se. They reported that it helped guide their decision-making choices in terms of comparing the characteristics of different tools.

[2] http://cloudworks.ac.uk/cloud/view/4042

The Co-evolution of Tools and Users

Tools and users are not static. Of course, technologies are continually developed and upgraded, but more importantly, users adapt and change their behaviour and the nature of the way in which they interact with tools over time, as they (1) become more proficient and confident at using the tools, (2) begin to appropriate and personalise use and (3) see new ways in which the tool can replace previous patterns of behaviour. This section will argue that users evolve their practice as they continue to embed their use of tools. Think, for example, of the way tools like Microsoft Word and email have become more and more ingrained in everyday practice since their original introduction. This shift is both at an individual and an organisational level. For example, using the Internet to find information is now ubiquitous across education, memos have been replaced by email communication and secretaries no longer laboriously type up handwritten letters (Conole et al. 2007).

Pea and Wallis (cited in Borgeman et al. 2008, p. 11) argue that there is a co-evolution of tools and users over time; interactions and patterns of user behaviour are not static. This co-evolution depends on both the inherent affordances of the tools and the characteristics of the users (i.e. their skills base, personal preferences and beliefs, and the context and culture within which they are interacting with the technologies). Whilst this has always been the case, arguably, the pace of change/co-evolution has increased dramatically in recent years, particularly around the use of Web 2.0 tools. There has been a shift from a static-content Web to one that is more interactive; peer critiquing, user-generated content, sharing, personalisation, adaptation and remixing are the kinds of user behaviours that characterise these new tools.

Pea and Wallis classify technologies into five phases: early communication mechanisms, symbolic representations such as language and mathematical notation, the first wave of technological media (radio, television, telephone, etc.), the emergence of networked and Internet-based technologies and finally, they argue, we are now in a fifth phases which they term ‘cyberinfrastructure’, which refers to the distributed, global nature of today’s technologies, such as grid and cloud computing. Hence, it is evident that there is a co-evolution of tools and users and that this co-evolution depends on both the inherent ‘affordances’ of the tools and the characteristics of the users (i.e. their skills base, personal preferences and beliefs and the context within which they are interacting with the technologies) (Fig. 6.2).

I will now discuss each of the positive affordances listed earlier in more detail.

Collaboration

Collaborative learning is an important aspect of socially situated learning. Inherent is the notion that learning with and through others is an important and valuable form of learning, particularly in today’s educational context, where the focus is on knowledge co-construction rather than information recall. New technologies have opened

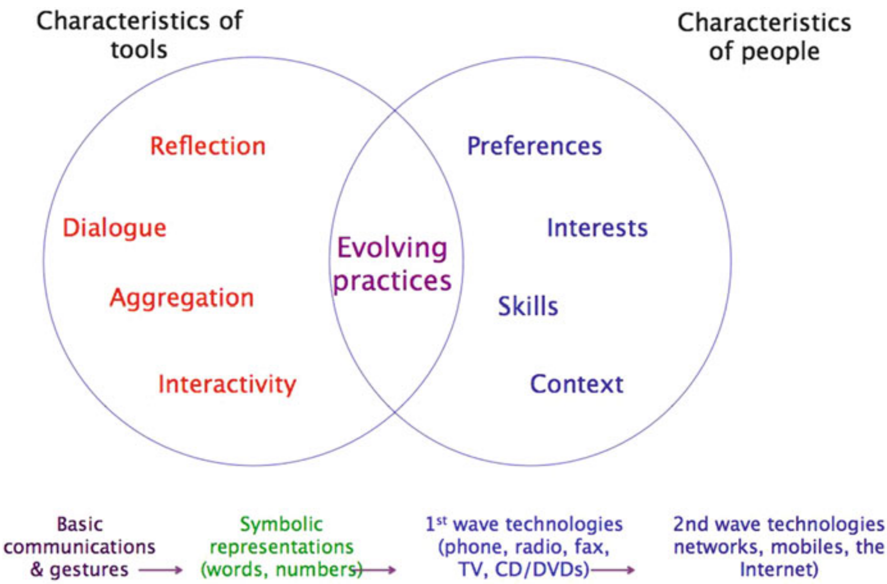

Fig. 6.2 The relationship between the affordances of technologies and user characteristics

up the possibility of new forms of dialogue and communication. ICT offer the potential to develop new forms of online communities and new means of communicating and sharing information, from signing up to specialised mailing lists through to involvement in specialised discussion forums and chat rooms.

It is important to distinguish between collaboration and cooperation. Jones et al. (2007) consider the two terms as follows. They cite Topping's definition of cooperation as:

> CO- means together in company, jointly, in common, equally, mutually, reciprocally, while -OPERATE means to work, act, influence, effect, accomplish, cause or carry out. (Topping 1992, p. 151)

In terms of collaboration, they reference Kaye, who defined collaboration as:

> Etymologically, to collaborate (co-labore) means work together, which implies a concept of shared goals, and an explicit attempt to 'add value' – to create something new or different through the collaboration as opposed to simply exchanging information or passing instructions. (Kaye 1992, p. 2)

Dillenbourg (1999) defined collaborative learning as:

> A situation in which two or more people learn or attempt to learn something together. (Dillenbourg 1999, p. 2; emphasis in original)

Jones et al. (2007) see cooperation as being applied more to a division of labour in which individuals achieve their aims by mutual assistance, whereas collaboration implies a stronger commitment to joint aims, as well as mutual assistance.

Collaboration can be promoted through a range of technologies. For example, action learning sets[3] can be set up in a discussion forum, where the students work together on a joint project, using the space to share and discuss ideas. Similarly, a wiki can be used as a space to support joint project writing. Social bookmarking sites can be used by a cohort as a means of aggregating a shared set of resources.

Reflection

The importance of reflection can be traced back to the work of Dewey (1916, 1933, 1938, 1949). Dyke et al. (2007) reference Dewey's definition of the term. They argue that Dewey contrasts reflective thought with reliance on instruction and the mere transmission of received wisdoms and defines reflection as:

> [A] better way of thinking that … is called reflective thinking: the kind of thinking that consists of turning a subject over in the mind and giving it serious and consecutive thought. (Dewey 1938, p. 113)

Dewey also stated that:

> The function of reflective thought is therefore to transform a situation in which there is experienced obscurity, doubt, conflict, disturbance of some sort, into a situation that is clear, coherent, settled, harmonious. (Dewey 1933, p. 195)

Asynchronous communication tools, such as forums, have long been considered to offer opportunities to support student reflection (Garrison 2002: Lyons 2010; Mason and Kaye 1989). Forums can be used in a semi-structured and moderated way or more openly as a space for students to share and discuss ideas. They provide a space for students to reflect and critique, where students can engage in discussion over a longer timeframe than is possible with face-to-face discussions. They can be used to augment face-to-face discussion providing a space for students to reflect on in-classroom debates.

Blogs can be used very effectively as a means of promoting reflection (Kerawalla et al. 2008; Yang 2009). For example, students can be asked to keep a reflective blog, which can be shared with the teacher, other students or more broadly. This is particularly useful in professional courses, where it is important for students to gain a clearer understanding of the theory they are learning and its relationship to professional practice. For example, when trainee teachers are on placement in schools keeping a reflective blog of their experience and its relation to educational theory can be very effective. Finally, e-portfolio can also be a good way of promoting reflection, as well as providing a mechanism for learners to aggregate and evidence their learning (Buzzetto-More 2010; Jafari and Kaufman 2006; Stephani et al. 2007).[4]

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[3] See http://www.foodsec.org/fileadmin/user_upload/eufao-fsi4dm/docs/PG_ALSets.pdf for a description of action learning sets.

[4] Also the JISC 'Effective practice with e-portfolios' guide, http://www.jisc.ac.uk/publications/programmerelated/2008/effectivepracticeeportfolios.aspx

Interaction

One of the often-cited benefits of new technologies is the way in which it can promote a range of interactions. The nature of interaction in online spaces is discussed in more detail in Chapter 14, where I separate out community (between learners and peers) from interaction (with technologies). I am using the term interaction here in terms of the interaction between users and technologies. It is concerned with the extent to which the user can manipulate their environment. Wagner defines interaction as follows:

> Interactions occur when these objects and events mutually influence one another. An instructional interaction is an event that takes place between a learner and the learner's environment. Its purpose is to respond to the learner in a way intended to change his or her behavior toward an educational goal. Instructional interactions have two purposes: to change learners and to move them toward achieving their goals. (Wagner 1994)

Siemens (2005) argues that interaction is essential for effective learning. Similarly Dyke et al. (2007) see interaction as one of the key aspects of effective learning, along with learning through thinking and reflection, from experience and activity, and through conversation.

Dyke et al. (2007) suggest that the non-linearity of the Web leads to the potential for different routes through tools and resources and different forms of learning. They argue that ICT enable the learner to move beyond linear pathways of learning, characteristic of, but not exclusive to, behaviourist approaches, and to adopt more individualised strategies and pathways.

Another aspect of the interaction affordance of ICT is the potential for multimodal and non-linear approaches to learning. Multimedia tools provide a way of giving learners not just access to materials but also a means of interacting with the materials. Examples include virtual simulations, where learners can change variables and see the effect on a model of say an ecological system. E-assessment tools can allow students to test out their understanding of a topic through a range of different types of online assessment questions. The system can then provide either instant feedback or forward the results for a teacher to provide feedback later. Clearly publishing tools such as blogs and wikis provide the user with the ability to produce user-generated content. In addition, there are now a range of tools that can allow users to mix and match different functionality, such as mash-up tools. Gaming environments and virtual worlds allow the user to interact in digitally authentic, specialised spaces. User actions in games, for example, will result in particular paths through the gaming material to be taken. In virtual worlds, it is also possible for users to acquire or even build new objects and personalities.

Dialogue

Learning through discussion with others is an important and well-recognised aspect of learning, going back to Vygotsky's work (1962, 1978).

New technologies have opened up the possibility of new forms of dialogue and communication. ICT offer the potential to develop new forms of online communities and new means of communicating and sharing information, from signing up to particular mailing lists through to involvement in specialised discussion forums and chat rooms. New technologies provide a plethora of ways in which learners can communicate with their peers, their teachers and others beyond the course cohort. Tools such as Twitter provide learners potentially with access to an international community of others with shared interests, providing the opportunity for just-in-time learning. As a learner of Spanish, I have used Twitter extensively in this respect. If I posted a tweet on something I did not understand (e.g. the use of the verbs ser and estar in a particular context), I would invariably get a near instant response from a number of people, providing me with different explanations of which term should be used and when.

Similarly, peer critiquing via blogs provides a mechanism for others to comment on thoughts and ideas. Indeed, this is a technique I have used in the process of writing this book in that I have posted draft chapters on which others have then provided comments.

Synchronous communication tools, such as chat tools, and audio and video conferencing provide a different forum for debate and discussion and can be used in a variety of ways to come to an agreed consensus on something, to discuss issues, to brainstorm ideas or as a backchannel to support events. In Chapter 15, I describe the way in which the conferencing tool, Elluminate, was used in conjunction with the social networking site, Cloudworks, to provide a rich interactive environment for discussion and debate.

Creativity

In a call for a special issue of the journal, EURODL,[5] Sorenson et al. (2010) argue that creativity is a key digital literacy skill that learners need to develop. They cite Runco (1996) who argues that:

> Creative thinking reflects the original interpretation of experience (Runco 1996). Each of us has the capacity to construct original interpretations, and if it is a useful and original interpretation, it qualifies as 'creative.' That is how creativity is typically defined, as both useful and original. (Barron 1955; Runco 1988)

Runco (2008) also argued that creative potential should be a primary concern for educators and that educators need to recognise that creativity is widely distributed; virtually every individual has the mental capacity to construct the personal interpretations that are involved.

[5] http://olnet.org/sites/default/files/OPEN-CALL-CreativityOER.pdf

The term creativity is derived from the Latin term ‘creo’ meaning to create or make.[6] It is about making something new (either a physical artefact or a concept) that is novel and valuable. It is about the ability to transcend traditional ideas, rules, partners and relationships and create meaningful new ideas, forms, methods and interpretations. It is important because it is an essential skill needed to deal with today’s complex, fast changing society. Furthermore, it is evident that it can be promoted through discourse and collaboration that are mediated through a range of social and participatory media.

Wallas (1926) identified the following five stages of creativity:

- Preparation—identifying the problem.
- Incubation—internalising of the problem.
- Intimation—getting a feeling for a solution.
- Illumination—creativity bursts forth.
- Verification—the idea is consciously verified, elaborated and applied.

Therefore, according to Wallis, the creative process moved through the initial identification and focus on a particular problem, through a moment of enlightenment and finally to validation through sharing with others.

Technologies can be used in a variety of ways to support creativity. They can promote creativity in new and innovation ways. They can enable new forms of discourse, collaboration and cooperation. They can provide users with access to knowledge that can be repurposed or represented via different forms of representation. New social and participatory media, in particular, enable the aggregation and scaling of information—distributed and collective.

Sorenson et al.’s special issue of EURODL explored the ways in which creativity can be promoted through the use of OER. In the call for papers they argue:

> In this special issue we are interested in exploring in more depth the nature of creativity and how this might be understood and used to better harness the potential of OER. In related work we have explored how alternative theoretical perspectives such as drama might influence our imagination in relation to how we use OER (Sorensen 2010), and how the use of collaborative pedagogical patterns might be used to support use of OER in collaborative learning contexts (Conole et al. 2010).

Other social and participatory media can also be used to promote creativity by representing knowledge in different ways, enabling learners to connect with others globally and by providing multiple, often serendipitous, routes through information.

Organisation

Being able to organise information is an important skill and an important part of the learning process. Learners need to be able to find and organise relevant information

[6] http://en.wikipedia.org/wiki/Creativity

for their learning so that it can be archived and easily retrieved. Learners need to be able to combine different sources of information to construct new understanding and meaning in relation to a particular topic. Arguably, the way information is organised forms a kind of mental schema, which in itself can act as a learning aid.

Asynchronous tools, like discussion forums, can be used by students to access and build up an archive of material relevant to their course. More generally, there are now a range of tools that students can use to aggregate resources, such as social booking sites. Referencing tools are useful as a means of organising research papers and can be used not only to compile references but also as a means of building up an annotated bibliography. Recommended sites can also be useful in terms of suggested related items of interest to a user, and RSS feeds mean that information can be filtered and pushed to the end user according to their own learning preferences.

Inquiry

Inquiry-based learning has long been recognised as one aspect of constructivism. The Personal Inquiry (PI) project (Sharples and Scanlon 2011), for example, developed an inquiry-based learning model (nQuire),[7] which was used as the basis for an online toolkit to promote inquiry-based learning in the development of scientific understanding in school children. Edelson et al. (1999) argue that inquiry-based learning is particularly important in a science context because science is essentially a question-driven, open-ended process, and therefore, students need to have personal experiences with scientific inquiry to understand this. They go on to suggest that inquiry activities provide a valuable context for learners to acquire, clarify and apply an understanding of science concepts.

Effective use of search engines can be used to foster inquiry-based learning, although it is important to note that learners need to acquire the necessary critical literacy skills in order to evaluate the relevance of the resources they find.

Authenticity

Learning by doing is another effective way to learn. Authentic learning is important in a rapidly changing world where the volume of information is ever expanding and where learners are likely to have multiple careers. Therefore, the development of expert thinking and complex communication are key skills for learners to develop. Lombardi (2007) argues that:

> The Internet and a variety of emerging communication, visualization, and simulation technologies now make it possible to offer students authentic learning experiences ranging from experimentation to real-world problem solving.

[7] http://www.nquire.org.uk/

She goes on to state that learners often express a preference for learning by doing and that they are motivated by real-life problems. Technologies provide a variety of mechanism for offering students authentic learning experiences based on experimentation and action. Furthermore, providing students with access to online research communities enables them to develop a deeper sense of the disciplinary culture.

Authentic learning focuses on real-world problems and can be promoted through role-play, problem-based learning, case studies and participation in virtual communities. Technologies can provide learners with access to real research data and researchers. Visualisation tools and haptic technologies can provide students with authentic experiences, closely mimicking real-world contexts. One example is the hapTEL project,[8] which has developed a virtual learning system that includes haptic and synthetic devices for use by trainee dentists.

Technologies can also enable students to cohabit persistent simulations or metaverses, allowing them to role-play, look at multiple perspectives to the same set of issues and adapt to a dynamically changing situation. Conole and Dyke (2004a) argue that:

> Information technologies provide a means by which people can be exposed to experiences very different to their own and extend their experience beyond their own communities. Experience of the 'other' through technology raises issues around authenticity and power in the 'virtual reality' that can be accessed. For example, there may be disjuncture between the mediated 'reported' experience and the reality of lived experience. It raises questions about how one distinguishes between what is real and what is rendered real via the technology.

Constraints

In addition to considering how different technologies can be used to support different forms of pedagogy through the affordances outlined above, there are also a number of constraints which the designer needs to consider. Firstly, a particular technology may be time consuming in terms of the development of it to support a particular learning intervention. Secondly, it may be time consuming in terms of the amount of support that the teacher needs to give to the learners in using the technology. For example, forums can require a significant amount of moderating. Thirdly, the technology may be difficult to use. For example, some wikis are difficult to get used to. Virtual worlds, like SecondLife, take time to adjust to and learners may need considerable support when they first use these tools. Fourthly, tools may be costly to produce, for example, rich multimedia resources not only take time but also resources to be developed. However, with the advent of the many free tools that are now available for producing content, arguably, this is becoming less of an issue. Fifthly, there may be assessment issues with use of particular tools; for example, what is the most appropriate way to assess group work using a wiki? Sixthly, tools may lack interactivity, for example, static Web pages, leading to potential student

[8] http://www.haptel.kcl.ac.uk/

disengagement. Finally, use of online social and participatory media can result in learner confusion and can be difficult to navigate; hence, clearly signposted learning pathways might be needed.

Conclusion

This chapter has defined the notion of affordances and discussed it in relation to the affordances of different technologies. It has argued that the term is valuable in that it describes the way in which there is a complex and dynamic co-evolving relationship between technologies and users. By considering first the positive affordances and then the constraints of different technologies in a particular learning context, practitioners can make more informed design decisions.

References

Barron, F. (1955). The disposition toward originality. *Journal of Abnormal Psychology, 51*, 478–485.

Blumenfeld, P. C., Soloway, E., Marx, R., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist, 26*(3 and 4), 369–398.

Borgeman, C. L., Abelson, H., Dirks, L., Johnson, R., Koedinger, K., Linn, M. C., Lynch, C. A., Oblinger, D. G., Pea, R. D., Salen, K., Smith, M., & Azalay, A. (2008). *Fostering learning in the networked world: The cyberlearning opportunity and challenge* (Report of the NSF Task Force on Cyberlearning). Available online at http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf. Accessed 7 Oct 2011.

Boyle, T., & Cook, J. (2004). Understanding and using technological affordances: A commentary on Conole and Dyke. *ALT-J, 12*(3), 295–299.

Buzzetto-More, N. (Ed.). (2010). *The e-portfolio paradigm: Informing, educating, assessing, and managing with e-portfolios*. Santa Rosa: Informing Science Press.

Conole, G., & Dyke, M. (2004a). What are the inherent affordances of information and communication technologies? *ALT-J, 12*(2), 113–124.

Conole, G., & Dyke, M. (2004b). Response to Boyle and Cook review of affordances paper. *ALT-J, 12*(3), 301–317.

Conole, G., Smith, J., & White, S. (2007). A critique of the impact of policy and funding on practice. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Themes, methods and impact on practice* (Part of the Open and distance learning series, F. Lockwood, ed.) London: RoutledgeFalmer.

Conole, G., McAndrew, P., & Dimitriadis, Y. (2010). The role of CSCL pedagogical patterns as mediating artefacts for repurposing open educational resources. In F. Pozzi & P. Donatella (Eds.), *Techniques for fostering collaboration in online learning communities: Theoretical and practical perspectives*. Hershey: IGI Global. Available online at http://oro.open.ac.uk/23040/. Accessed 11 Aug 2011.

Dewey, J. (1916). *Democracy and education*. New York: Macmillan.

Dewey, J. (1933). *The middle works, 1899–1924, in Boydston, J. edited collection*. Carbondale: Southern Illinois University Press 1976–1983.

Dewey, J. (1938). *Experience and education*. New York: Collier Books.

Dewey, J. (1949). *Experience and existence in Boydston, J. edited collection, John Dewey The later works*, *1949–1952* (Vol. 16). Carbondale: Southern Illinois University Press.
Dillenbourg, P. (1999). *Collaborative-learning: Cognitive and computational approaches*. Oxford: Elsevier.
Dyke, M., Conole, G., Ravenscroft, A., & De Freitas, S. (2007). Learning theories and their application to e-learning. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Theories, methods and impact on practice*. London: Routledge.
Edelson, D. C., Gordin, D. N., & Pea, R. D. (1999). Addressing the challenges of inquiry-based learning through technology and curriculum design. *The Journal of the Learning Sciences, 8*(3 and 4), 391–450.
Garrison, D. R. (2002, September). *Cognitive presence for effective asynchronous online learning: The role of reflective inquiry, self-direction and meta-cognition*. Invited paper presented to the Sloan Consortium Asynchronous Learning Network Invitational Workshop, Lake George, NY. Available online at http://oit.hostos.cuny.edu/socialnetwork/effectiveonlinelearning/files/2009/09/Learning-Effectiveness-paper-Garrison.pdf. Accessed 11 Aug 2011.
Gaver, W. W. (1991, April 28–May 2). *Technology affordances*. CHI'91 Conference Proceedings (pp. 79–84), New Orleans, Louisiana.
Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing* (pp. 67–82). Hillsdale: Lawrence Erlbaum.
Gibson, J. J. (1979). *The ecological approach to visual perception*. Hillsdale: Lawrence Erlbaum.
Jafari, A., & Kaufman, C. (2006). *Handbook of research on ePortfolios*. Hershey: Idea Group Reference.
Jones, C., Cook, J., Jones, A., & De Laat, M. (2007). Collaboration. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research*. London: Routledge.
Kaye, A. R. (Ed.). (1992). *Collaborative learning through computer conferencing: The Najdeen papers*. Berlin: Springer.
Kerawalla, L., Minocha, S., Kirchup, G., & Conole, G. (2008). Characterising the different blogging behaviours of students on an online distance learning course. *Learning Media and Technology, 33*(1), 21–33.
Lombardi, M. M. (2007). *Authentic learning for the 21st century – An overview*. Educause Learning Initiative publication. Available online http://net.educause.edu/ir/library/pdf/ELI3009.pdf. Accessed 11 Aug 2011.
Lyons, N. (Ed.). (2010). *Handbook of reflection and reflective inquiry: Mapping a way of knowing for professional reflective inquiry*. New York: Springer.
Mason, R., & Kaye, A. (1989). *Mindweave: Communication, computers and distance education*. Oxford: Pergamon.
McGrenere, J., & Ho, W. (2000, May). Affordances: Clarifying and evolving a concept. In *Proceedings of Graphics Interface*. Available online at: http://www.dgp.utoronto.ca/~joanna/papers/gi_2000_affordances.pdf. Accessed 11 Aug 2011.
Norman, D. (1988). *The psychology of everyday things*. New York: Basic Books.
Norman, D. (1998). *The invisible computer*. Cambridge: MIT Press.
Runco, M. A. (1996). Creativity and development; Recommendations. *New Directions for Child Development, 72*(Summer), 87–90.
Runco, M. A. (1998). Creativity research: Originality, utility, and integration. *Creativity Research Journal, 1*, 1–7.
Runco, M. A. (2008, May). Creativity and education. *New Horizons in Education*, *56*(1).
Salomon, G. (Ed.). (1993). *Distributed cognitions – Psychological and educational considerations*. Cambridge: Cambridge University Press.
Sharples, M., & Scanlon, E. (Eds.). (2011). *Final report: Personal inquiry (PI): Designing for evidence-based inquiry learning across formal and informal settings*. Nottingham: University of Nottingham.
Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1), 3–10.

Soegaard, M. (2010). *Affordance*. Available online from Interaction-Design.org: http://www.interaction-design.org/encyclopedia/affordances.html. Accessed 11 Aug 2011.

Sorenson, E., Conole, E., & Marlung, A. M. (2010). Special journal issue on creativity and Open Educational Resource (OER), Special issue of EURODL, http://www.eurodl.org/?p=Special&sp=init2. Accessed 11 Aug 2011.

Stephani, L., Mason, R., & Pegler, C. (2007). *The educational potential of e-portfolios: Supporting personal development and reflective learning*. London: Routledge.

Topping, K. (1992). Cooperative learning and peer tutoring: An overview. *The Psychologist: Bulletin of the British Psychological Society, 5*, 151–161.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: MIT Press.

Wagner, E. D. (1994). In Support of a function definition of interaction. *The American Journal of Distance Education, 8*(20), 6–29.

Wallas, G. (1926). *Art of thought*. New York: Harcourt Brace.

Weiser, M., & Seely Brown, J. (1995). *Designing calm technology*. Palo Alto: Xerox Parc. Available online at http://www.ubiq.com/hypertext/weiser/calmtech/calmtech.htm. Accessed 11 Aug 2011.

Yang, S. H. (2009). Using blogs to enhance critical reflection and community of practice. *Educational Technology and Society, 12*(2), 11–21. Available online at http://www.ifets.info/journals/12_2/2.pdf. Accessed 11 Aug 2011.

Chapter 7
Design Languages and Learning Design

Introduction

This chapter provides a definition for the term 'design language' and provides examples of how it is used in a number of professional domains. It summarises the research on design languages and considers how this relates to the notion of a learning design language. It provides a useful contextual background to the discussions in later chapters on the design visual representations and associated visualisation tools, such as the CompendiumLD tool[1] developed as part of the OULDI work. This chapter draws in particular on Botturi and Stubbs (2008), who provide an authoritative account of design language research.

Design is a key feature of many professions; this chapter considers design practices in three disciplines—music, architecture and chemistry—and describes how design approaches have been developed in each of these. I then summarise some of the key characteristics of design practice and explore the implications of these in terms of the application of design principles to an educational context.

The Challenges of Designing for Learning

Falconer and Littlejohn (2008, p. 20) argue that there are three challenges facing teachers: (1) the increasing size and diversity of the student body, (2) the increasing requirement for quality assurance and (3) the rapid pace of technological change. Conole (2004) has argued that there is a gap between the promise and reality of the use of technology in education and that there is little evidence that education has changed fundamentally as a result of the use of technologies. Much use of technology appears to simply replicate bad classroom practice resulting in simple Web page

[1] http://compendiumld.open.ac.uk/

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_7,

turning (Oliver 2000). Similarly Masterman (2008a, p. 210) argues that the lack of uptake of technologies is due to a number of factors: lack of awareness of the possibilities, technophobia, lack of time to explore the use of technologies, aversion to the risks inherent in experimentation and fear of being supplanted by the computer. Agostinho et al. (2008, p. 381) suggest that the uptake of the use of high-quality ICT-based learning designs in higher education has been slow. Factors include low levels of dissemination of ICT-based learning projects, lack of ICT-based learning examples to model and lack of time, support and training. Sawyer (2006, p. 8) argues that the impact of the significant investment in computers in schools has been disappointing. There are few studies that show that computer use is correlated with improved student performance. Similarly, Koedinger and Corbett (2008, p. 61) write that as new technologies have emerged, many hoped that they would have a radically transformative effect on education, but in reality the impact has been much less than expected.

A key issue is that teachers do not know how to design, mainly adopting an implicit approach based around prior experiences and practices. Falconer and Littlejohn (2008) explored practitioners' design practices through a series of workshops. As a result, they identified the following challenges with representing models of practice:

- Ownership of representations: Different representations are effective for different communities and there are a number of different purposes a representation needs to fulfil.
- There are issues around the purpose of representations: In terms of being generic or a detailed sequence used for orchestration or offering inspiration to teachers in terms of implementing them and hence changing practice.
- Designs are both a product and a process; both aspects are important.
- The degree of granularity of the design: They found that the most common level of granularity is around a lesson plan for 1–2 h of learning.

Practitioners' Approaches to Design

The extensive range of data collected in the OULDI described earlier in this book provides a rich body of empirical evidence to inform our thinking and the development of appropriate tools for design. In summary, we have conducted a series of interviews (Clark and Cross 2010), workshops and focus groups with practitioners to elicit their approach to design and any associated challenges. A series of key questions were asked, including:

(a) The process of design: How do practitioners go about designing learning interventions?
(b) The representations of design: What representations (textual and visual) do they use?
(c) Where do they get help and support?
(d) How do they share and discuss their designs with others?
(e) How do they evaluate the effectiveness of the designs?

In addition, the workshops and focus groups enabled us to explore in more depth different aspects of the design process.

Participants were given the opportunity to use a range of representations to create, share and discuss design ideas. The workshops included detailed feedback and evaluation and the artefacts produced were shared on the social networking site Cloudworks,[2] which is discussed in Chapter 15. Data was also analysed for 43 case studies of the use of the Moodle VLE course management tool. The case studies were derived from a series of interviews with OU course leaders[3] (Wilson 2007). The focus was on the pedagogies used to achieve specific learning outcomes and the use of tools (blogs, wikis, e-assessment, etc.) to support learning activities. Interviews were semi-structured around four core themes: contextual data (level, subject, etc.), details about the learning activity being described and the sub-tasks involved, pedagogical approaches adopted, and barriers and enablers to the creation of the activity (both technical and organisational). Each interview lasted about an hour and was recorded and transcribed. Following this, the text was edited in a standard template form and a diagrammatic representation of the learning activity drawn. The content was checked for accuracy with the interviewees.

This section provides a summary of some of the key findings from the empirical data; a more detailed discussion of some of the findings from the interviews with teachers/designers is provided elsewhere (Clark and Cross 2010).

The empirical data provided a rich picture of the way in which teachers design. It was evident from the data that there was no one perfect tool for design and that individuals had different preferences of how they went about the design process—some sketching ideas out and linking them, others working systematically from learning outcomes, while others used the subject content as a baseline for development. Some used a combination of approaches at different stages of the design. The interviews and case studies provided valuable insights into the design process that cluster into five overarching themes: the process of design (how practitioners go about designing learning activities), support and guidance (where they get ideas and support from), barriers to innovation (what barriers or problems they encounter), representing designs (the ways in which they articulate and visualise designs), and evaluation mechanisms (the ways in which they assess the effectiveness of the designs they create) (Fig. 7.1).

The most prominent finding from the interviews was that design is a messy, creative and iterative process and that even when working in teams, there is a large element of individuality in the design process. Teachers design at different levels of granularity and focus on different aspects of design over the design life cycle. Both the interviews and the workshops gave us a clearer understanding of the design strategies that teachers adopt. Foci for design include looking at learning outcomes

[2] http://cloudworks.ac.uk

[3] OU courses are designed by teams of academics; associated lecturers then support the learning and mark assignments.

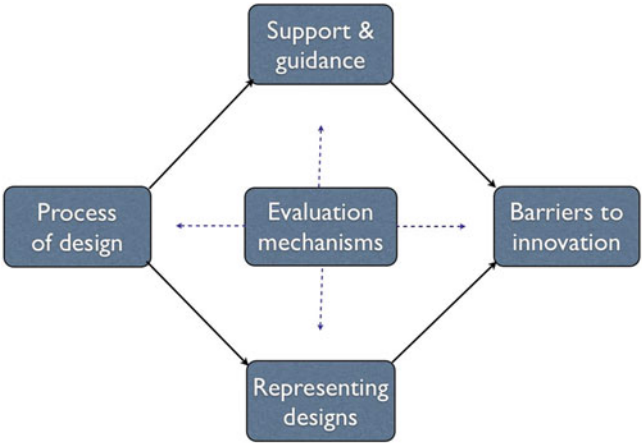

Fig. 7.1 The five overarching themes on design approaches and methods

and mapping these to assessment strategies, integrating the use of external resources with locally authored materials, designing activities to test understanding, integrating a range of tools and approaches, addressing different learner preferences and levels of competence, and mapping to externally prescribed professional requirements. The following quote, from one of the practitioners, is illustrative of this:

> It's not in one direction. Not sure if I always start with aims, sometimes I do! Broad aims, then thinking about the mix, go to the palette and look at existing resources, what will the budget allow us to do (chairs hat on), what additional resources do we need, which would be most effective to teach certain things. For example, we need this software to help teach linguistic analysis. We might want some video analysis, so think about how to bring in video sequences, what videoing needs to be done. Then start writing. It's chicken and egg. Sometimes start with study guide and then think about activities, and then think I need this bit of video. But you don't always have luxury of working in this direction or budget to do filming so start looking for other sequences and build activities around those. [Interview 160607]

The following quote gives an example of how a teacher iteratively develops their concept of the course over a period of time and how they kept an evolving record of relevant resources and materials for the course:

> I was building a sense of what the new course might be … we must remember to do x, or a url of relevance. [Interview 160607]

It was also evident that design for a new course is very different to design when redeveloping a course based on interpretation of student feedback and evaluation. The interviews revealed that there was no simple route to teachers accessing support and guidance on the design process. Little use appeared to be made of online resources and networks—most adopted a serendipitous approach, relying on peer practitioners and close colleagues for ideas. One interviewee from the case studies conducted by Wilson (2007) said:

> This says more about me than it does about the stuff really but I preferred the corridor conversations. It was a way of … I had invested quite a lot of money in coffee and so there were a whole set of people across the university who I took to coffee and pumped them for what I could really. [Case study interview 210107]

Those interviewed recognised the value of sharing and reuse, but there was little evidence that they shared their designs with others or adapted and repurposed designs created by others. Different forms of representation of learning activities (textual, visual, etc.) all had different advantages and disadvantages, and there was evidently a distinction between the process of producing a design and design as an artefact. When shown visual presentations of learning activities, for example, many of those interviewed found it difficult to interpret them, to apply/adapt them to their own context. However, on further probing, they could see a genuine benefit in using visual tools as a means of mapping their own practice, as is evident in the following quote from one of the interviews:

> [On the value of a visual representation] It always needs to be brought to life, to have some form of enactment … Would I want to see what someone else has done, yes I suppose so. [Interview 141107]

The conflict between the process of the dynamic creation of an activity and the associated sense of ownership the designer has in the process contrasts with design as a product, a static artefact. For example, one interviewee struggled to see the benefit of a visual representation of someone else's design, even though it was an activity in her subject area. She continued later in the interview to argue for the need for a mediation role to help interpret designs and as she says 'make them come alive':

> [One being shown a visual representation of a learning activity] It's such a different context and level. This is language teaching rather than linguistic teaching. And there isn't the contextual information, even with you having just explained a little, which helped, without you there I'd be looking at this and thinking … I think there'd be too much work to look in to this plus the recontextualisation. I wouldn't spend the time to be honest.
>
> I really think you need someone who goes to the course team, although not necessarily staying with them. And sits down, not right at the start but a little way in, and asks what are you teaching and what resources are you going to use alone or in combination and that person would go away do some work and come back - have some insight into bringing together their knowledge of the technologies available and which would best fit your intention and provide you with a map - that's when a map would work, they'd be bringing it alive. [Interview 141107]

The interactive and holistic nature of the design process came out strongly across the data:

> One of the difficulties is mapping the whole process. I have tried to approach course design using a holistic approach. [Interview 121107]

Teachers differed in the extent to which they worked visually or textually; some used software, others sketched or wrote out ideas and one teacher had a scrapbook which he used as he was developing his design ideas:

> It's in words, not diagrams a dumping ground for thoughts - [to] capture thoughts. [Interview 121107]

Others used visualisation as a means of mapping different elements of the design process:

> List of words clustered into blocks, arrows … can you have clusters link to TMAs[4] [Assignments]. [Interview 141107]
>
> Start from assessment strategies and learning outcomes and get an alignment. [Interview 151007]
>
> I tend to sit and doodle a map - will draw the logic and flow of the course on paper and then go to Compendium. Then the problem is sharing it. [Interview 291107]

The interviews also highlighted a number of contradictions about the process of design, forms of representation for design and the nature/type of support, which teachers wanted. Firstly, there was a tension between design as process and design as artefact; both were considered important. Secondly, there is the difficulty of capturing what is inherently an implicit process. Thirdly, teachers wanted subject-specific case studies and examples. Fourthly, there are a variety of influences on the different forms of representation and individuals' interpretations of them. Fifthly, there is the desire for specific, just-in-time help and support. Finally, there is the issue of how to map the evolving dynamic and changing nature of design.

Similarly, the Learning Management System (LMS) case studies (Wilson 2007) highlighted a range of overarching themes:

- Designers/teachers relied extensively on their prior experience and the local context for development.
- There was uncertainty associated with the constantly changing functionality offered by available technologies.
- The willingness, access and ability to facilitate the transfer of good practice varied considerably.
- Existing online learning design resources (case studies, theoretical frameworks, toolkits) were used very little.
- The design process is messy, creative and iterative.
- Existing institutional systems did not adequately reflect new ways of working and effective use of new approaches and technologies.
- The need to take account of the changing nature of the student and academic roles and associated skills set.
- The importance of motivating individuals (both learners and teachers) in driving forward innovative practice.
- The increase in the amount of online activities and materials used in courses has led to the necessity for more frequent redesigns of courses.
- Issues emerged about the balance of resources and activities associated with the OU's Supported Open Learning (SOL)[5] two-stage process of production and presentation.

[4] Tutor-marked assignments.

[5] This is discussed in more detail in Chapter 11.

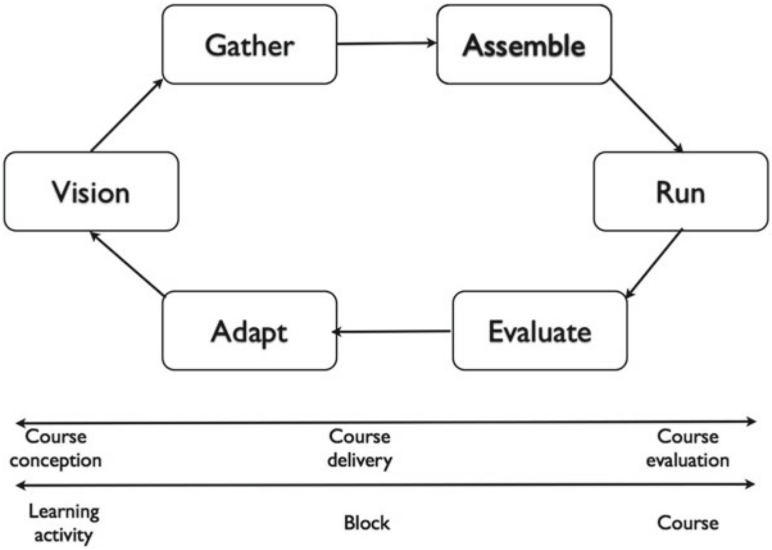

Fig. 7.2 The five overarching themes on design approaches and methods

The interviews also gave us a better understanding of the nature of the design life cycle. Figure 7.2 outlines the six main aspects of the design life cycle. The cycle begins with the designer's vision and focus for the learning intervention. The second stage is the gathering of relevant resources and tools. The third is assembling these into a sequence. The fourth is running the learning intervention. The fifth is evaluating its effectiveness. The final stage is adaption in light of evaluation feedback, which may in turn lead to changes in the original vision. These six stages can be mapped from course conception, through delivery and finally evaluation. The cycle can operate at a number of levels: a learning activity (typically of the order of a few hours of learning), a block level (usually a semester's worth of work) and a course level (which might be a master's or degree-level course programme).

Repurposing an Open Educational Resource

In related work, as discussed in Chapter 5, we explored teachers' conceptions of design in terms of how they might repurpose stand-alone open educational resources (OER) to support their use in collaborative learning activities (Conole et al. 2010). A series of workshops were run, in which participants explored existing OER and used a set of collaborative pedagogical patterns (Hernández-Leo et al. 2006) to redesign the OER for use in a collaborative learning context. The workshops were video recorded and the discussions transcribed. The findings from this work were similar to the findings from the interviews and case studies described earlier. Analysis of the data revealed a number of themes that are discussed here. Part of our approach is predicated on the notion that OER have inherent designs and that if we can make those designs more explicit, this will aid repurposing. A number of themes emerged with respect to this, which are discussed in this section. In the following sections, participants are represented as P1, P2, etc., while the workshop facilitators are indicated as F1, F2, etc.

It was evident that there were a number of ways in which textual representations could emphasise different aspects of the design—some were descriptive in nature, others were more metaphorical and others more operational—for example, a bullet list articulating steps in a learning sequence. A common approach adopted by the participants was to have a temporal sequence. Another strategy was to focus mainly on the content and associated resources. Participants started from different perspectives; some began by considering the learning objectives, while others started with the content or activities:

> **P2**: My resource is a design by itself. So, it is the design of an activity, it is the representation of that, a few bullet points and then a graphical representation…. So the resource basically represents arrows pointing into a sequence of the activities.

It was interesting to see the extent to which each of the representations was easily shareable with others. More often than not, a dialogic engagement was necessary to help make sense of the design and to clarify misunderstandings. The exercise and subsequent discussion enabled us to tease out both the main facets of design and participants' different perspectives and approaches. In addition to articulating objectives, content and tasks, some of the participants evidenced a subtler level of design, associated with the inherent principles of the design:

> **P3**: My resource is task-driven, so that is the principle and also it integrates many pedagogies into the content, so, and also it is question based.

In terms of principles, we explored whether or not they had articulated a principle around individuality/collaboration. A range of characteristics was identified as being associated with the design—the objectives, generic characteristics, sequence of tasks undertaken and whether it had an individual or collaborative focus. Participants recognised that it was important to clarify what information was essential to communicate so that the activity could be subsequently taken up and adapted by others:

> **F1**: Just try to think again of what elements you wrote down and what elements you used when you tried to explain it to your neighbour and try to think whether they were mainly based on objectives, mainly based on the characteristics of the activities, of a temporal sequence or …

One of the participants suggested that it would be valuable to have multiple views of the same design, each view representing a different aspect:

> **P7**: So probably having different layers of visualization of the same structure could help filter the relevant information if you are looking at the learning objectives, or if you are looking at interactions, something like that, so, another thing that we were thinking about it probably what is missing is a legend of the different items, because we understood that there is a mixing of two layers, one is devoted to the designer, for example, all the questions in blue are annotations for the designers while for example it is very clear that the sequence for students is talking to the student verbally, it is talking to him, so probably having the

legends saying ok, question mark annotation for the designer and the red bits are feedbacks we had from one evaluation and then filtering visually this information according to the task you are following.

This participant also argued that visualisation potentially has additional power, particularly if a semantic dimension is included:

P7: A semantic of visualizations, really we understood that some of the connection are more related to cognitive activities of the design where as others are tactical activities of the use (missing comment) and cause and some other connection are like database connections with the resources and what they are looking, so probably having different semantic of the connections and representations.

Another aspect of importance, that the participants mentioned, was identifying the quality and provenance of the resource; that is, designs need to do more than display the sequence of activities and users need some indication of how effective and fit for purpose it is. There are two ways in which this can be achieved. Firstly, in the design representation itself, however, the more detail that is included in the design, the more complex it is. Secondly, an alternative is to have a wrap-around dialogue about the resource and its design, in a social networking site, such as the Cloudworks site[6] which is discussed in more detail in Chapter 15. The data revealed that deconstruction and subsequent reconstruction of OER is complex; indeed, it is possible to identify four layers that need to be considered to make the most effective repurposing of an OER. Conole et al. (2010) identified the following four aspects of this:

1. Visual representation of the design. How can the implicit OER design be made more explicit and hence shareable?
2. Opinion of goodness. How appropriate is the OER for use in different educational contexts?
3. Transferability through pedagogical patterns. How can generic patterns be applied to specific contexts?
4. Level of discussion, critique and contextualisation. How might social networking sites, like Cloudworks, act as a supporting structure to foster debate between those using the same OER?

In conclusion, describing design was seen as a difficult and unfamiliar task. It is evident that there are multiple solutions to any one design problem. There are also many options for what can be included, and it is hard to interpret designs in a consistent way. Finally, any one design representation is only able to capture partial details.

Design Languages

It is worth beginning by comparing general language use with design language. Language is what people use for communicating information and ideas; design language is what designers use to communicate design plans and intentions to each

[6] http://cloudworks.ac.uk

other. Cole et al. (1997) argue that 'the languages used to a great extent shapes what can and cannot be thought and said' (cited in Gibbons and Brewer 2005, p. 113).

Design languages can be used both to generate designs and as a mechanism for interpreting and discussing them (Gibbons and Brewer 2007). They are used in a range of professions, where there is a focus on developing a specific artefact of some kind. Examples include architecture, music composition, writing, choreography, mathematics and computer programming. With reference to the design of software systems, Winograd (1996) argues that design is not a static noun but refers to the activity of design. He identifies a number of important aspects: design as a conscious process, design as dialogue with materials, design as a creative process, design as a communicative process and design as social activity. He describes design languages as 'visual and functional languages of communication with the people who use an artefact. A design language is like a natural language, both in its communicative function and in its structure as an evolving system of elements and relationships among those elements' (Winograd 1996, p. 64).

Botturi and Stubbs (2008) demonstrate that there is a plethora of languages available to choose from, ranging from sketch-oriented languages that facilitate the creation and representation of the grand view of a design to more formal languages that enable detailed representations of specification and/or implementation details of a design. Botturi et al. (2006, p. 1), citing Gibbson and Brewer, define a design language as 'a set of concepts that support structuring a design task and conceiving solutions'. They go on to define a design language as a mental tool that can be expressed and hence communicated through a notation system (i.e. a set of signs and icons that allow representing a design problem or solution so that it is perceivable by our senses).

Design theory refers to identifying methods (or models, techniques, strategies and heuristics) and when to use them. Reigeluth and Carr-Chellman (2009a, b, p. 7) argue that design theory is different from descriptive theory, in that it is goal oriented and normative. It identifies good methods for accomplishing goals, whereas descriptive theory describes cause-effect relationships. Arguably, teachers need to develop both—design expertise through application of a design-based approach to the creation of learning interventions and descriptive expertise in terms of interpreting and understanding the learning that takes place. The open learning design methodology described in this book aims to facilitate the development of both approaches.

Goodyear and Retalis (2010) describe the role of language generally in terms of supporting abstract thought and the ability to deal with complex conceptual change. They argue that it involves the creation and manipulation of symbolic representations of the world.

Gibbons et al. (2008) argue that design languages are an important aspect of instructional design. They define a design language as a 'set of abstractions used to give structure, properties, and texture to solutions of design problems'. Hohanson et al. (2008, p. 19) suggest that a design language is 'what designers use to communicate designs, plans and intentions to each other and to the producers of their artifacts', citing Gibbons and Brewer (2005, p. 13). Rose (2001) argues that understanding visual representations is a learned skill. As I will discuss elsewhere in this book, there are a range of new digital literacies that teachers need to acquire in order to design effective learning interventions that make effective use of new technologies (Jenkins et al. 2006; Jenkins 2009).

Visual languages serve several purposes: (1) to communicate a message through a visual or functional language; (2) to provide a synthetic idea, image or metaphor of complex ideas; and (3) to create a grammar or produce meaning for its use. Gibbons et al. (2008) argue that design languages: (1) encourage disciplined design practice, (2) give organisation to the growth of design fields, (3) help give historical context to evolving design fields and (4) connect practices of a design field to theoretical concepts.

Botturi et al. (2006) argue that educational modelling languages have emerged as conceptual tools to help designers deal with the increasing complexity of designing for learning making effective use of new technologies and pedagogies. They argue that they enable the development of reflective practice and potentially enhance a more thorough understanding and reuse of e-learning. Derntl et al. (2008, 2010) suggest that a shared design language is one mechanism for dealing with design complexity and the requirements of communication in interdisciplinary design teams. They argue that designing for learning needs both 'beauty' and 'precision'; and they show how different design languages can be used to present these. They state that 'we are in no way suggesting that beauty and precision are in opposition to one another, nor even that they are mutually exclusive concerns. We make the distinction merely to further stress the competing demands on instructional designers for maintaining a grand view of the learning experience while also addressing the myriad details of an effective end product'.

Stubbs and Gibbons (2008, p. 35) suggest that visual representations serve two purposes in design: (1) They can be used during design as part of the design process to represent some aspect of instruction before it is produced or represented (this may be in the form of storyboards or flow charts) and (2) they can be part of the content that is being produced. They also argue that design drawing can aid the designer by reducing cognitive load during the design process, and because a design sketched is an external representation, it can augment memory and support informational processing. They also suggest that another view of drawing is similar to Vygotsky's description of the relationship of language to thought (Vygotsky 1978). Substituting drawing for words, Vygotsky said: 'Thought is not merely expressed in (drawings), it comes into existence through them'. Languages in general provide advantages that are particularly useful in design. Firstly, they allow thought to be communicated so that good ideas do not get lost. Secondly, they provide a focus of attention that permits higher-order processing and anchoring of thought. Thirdly, they provide the ability to question and judge the value of the thought—to construct thoughts about thought. Jackendoff (1996) suggests that there are two stages to the design process: sketches to try ideas out and, as the design progresses, the drawings become more formal and more governed by rules and conventions.

McKim categorises abstract graphic languages into seven types—Venn diagrams, organisation charts, flow charts, link-node diagrams, bar charts and graphs, schematic diagrams and pattern languages, (McKim 1980)—whereas Laseau (1986) categorises them into four main types: bubble diagrams, area diagrams, matrices and networks.

Massironi (2002) has produced a taxonomy of graphic productions, which categorises design drawings by their form and purpose. He distinguishes between representational (physical reality) and non-representational (abstract concepts) drawings. Botturi (2008, p. 112) identifies two types of languages: (1) finalist communicative languages, which serve the purpose of representing a complete instructional design for communicating it to others for implementation, reuse or archive and (2) representative, which help designers think about the instruction they are designing and support its creation. The ability to express an idea allows people to better analyse and conceptualise it and to make better design decisions.

Boling and Smith (2008) describe the range of mediating artefacts that are used to support design as both process and product. The way in which we are using the concept of mediating artefacts in the design process is described elsewhere (Conole 2008) and was discussed in more detail in Chapter 5. Boling and Smith highlight the importance of sketching and consider the interplay between the two modes of mental representation required for sketching—propositional (largely symbolic) and analogue (quasi-pictorial, spatially depictive). They reference Goldschmidt (1991), who argues that there is an oscillation between propositional thinking and descriptive thinking during the process of design.

Botturi et al. (2006) described a number of commonly used design languages. A selection of these is provided here. The intention is not to be comprehensive but to give an illustration of the different kinds of design languages that have been developed and to describe how they are used for different purposes and with different kinds of users; the examples described range from computer-runnable formal languages to more ‘fuzzy’ and less formal languages that are aimed at practitioners.

Gibbons and Brewer (2005, p. 121) argue that once a notational system is established, it can become (1) a tool for remembering designs, (2) a structured problem-solving workspace in which designs can take form and be shared and (3) a kind of laboratory tool for sharpening and multiplying abstract design language categories. Indeed, it is evident that there is a complex evolution of design languages and associated notations and that this evolution is closely tied to the nature of the subject domain and what is of particular importance to foreground and emphasise. So for music it is ensuring the accurate representations of the sounds in time, for architecture it is seeing the ways in which the different components connect and how they look overall and in chemistry it is about foregrounding the associated chemical properties and patterns of behaviour of the atoms and molecules.

Gibbons and Brewer (2005, p. 115) list a set of dimensions of design languages. The first is complexity, namely, that design is merely partial representation of much more complex and multifaceted ideas in our minds. The second is precision; there is a tension between the natural, fuzzy nature of real practice and tightly defined specification. This tension is very evident in an educational context, in particular in the specification of formal technical learning designs that can be translated into machine-readable code as opposed to fuzzy, practice-based designs. The third is formality and standardisation, which refers to the importance of ensuring that terms used mean the same to all users. The fourth is the tension between personally created designs and those that are shared with others. Designs only become public or shareable through negotiation and interaction with others. Designs should never be seen as static artefacts and are always dynamic and co-constructed in context. The fifth is the tension between implicit, individual designs to those that are completely explicit with clearly defined terms and rules. Again, this is a crucial issue in an educational context, where traditional teaching practice has been implicit and designs fuzzy. Shifting to more explicit and shareable designs requires a change of mindset and practice. Related to this are issues around standardisation versus non-standardisation. In terms of these points, there is a tension with designs in terms of how much they focus on precise presentation and specification and how much on the more aesthetic, visionary aspects of the design. Derntl et al. (2008) consider this in an instructional design context, arguing that:

> On the one hand, solutions should be creative, effective and flexible; on the other hand, developers and instructors need precise guidance and details on what to do during development and implementation. Communication of and about designs is supported by design languages, some of which are conceptual and textual, and others more formal and visual.

They present a case study where both a creative solution ('beauty') and clear-cut details ('precision') are sought. Finally, there are issues around computability. Some languages are formalised and precise and hence can be converted into machine-runnable code. Gibbons and Brewer (2005, p. 118) go on to argue that designs can be shared in two ways: (1) by a description that relies on natural language or (2) through a specialised notation system that uses figures, drawings, models or other standard symbolic representations to express the elements and relationship of the design.

Designs have a number of components. Firstly, the context in which the design is created and used; a design carries with it a sociocultural element, that is, the background and context, both of the individuals involved and the educational setting. Secondly, the inherent beliefs of the designer; that is, a design carries with it intentions, aspirations and beliefs. In a learning context, this is the designer's beliefs about what should be learnt and how it should be achieved. Donald et al. see this inherent belief basis of teaching practice as a vital tool for unlocking and shifting practice (Donald and Blake 2009; Donald et al. 2009). They have developed a learning design system, HEART (HEaring And Realising Teaching-voice), which aims to support teachers' learning design practice by eliciting and depicting the pedagogical beliefs underpinning a learning design or a resource. In an educational context, our implicit designs are based on a mix of theoretical concepts, prior examples, personal ideals and idiosyncratic opinions. Finally, designs should encourage reflection and should support iterative redesign and reuse.

Design Notation in Music, Architecture and Chemistry

I now want to turn to some examples of how design languages are used in other professions. I will consider three examples: the development of musical notation, architectural designs and design in chemistry.

Fig. 7.3 Music notation (Source: http://www.flickr.com/photos/anyaka/21848267/ and http://www.flickr.com/photos/13519089@N03/1396447714/)

Musical Notation

Dalziel (2009) compares the development of a learning design notation to the emergence of a notation for music. Musical notation captures abstract musical designs in the form of graphical, textual and symbolic representations. It is precise enough that a piece of music written by a composer from 300 to 400 years ago can be accurately replayed. Early musical notations can be traced back to 2,000 BC, but the standard notation used today is a relatively recent phenomenon. Before its development, music had to be sung or played from memory. This severely limited the extent and reach of music, as well as resulting in a loss of fidelity of the original music as they were transferred from person to person memorising them. Musical notation went through a range of forms before settling on the notations we use today (Fig. 7.3). The notation includes a complex set of instructions about not just the notes to be played and their sequence but the timing, intonation and even some of the emotion embodied in the music.

Architectural Notation

Architectural notation helps articulate and share an architect's origin of vision behind the development of a building and make it explicit and shareable with others involved in the design and development of the building. For example, Fig. 7.4 shows some modern architecture in Valencia. The building manages to convey both functionality with emotion and an element of organic form. The creation of this will have involved a complex range of design representations, from the initial vision/intent of the architect to actual creation of the building. Buildings are complex and three dimensional. Design decisions have to cover a range of factors, such as the layout of the building, the relationship between the different components, the types

Fig. 7.4 An example of modern architecture in Valencia

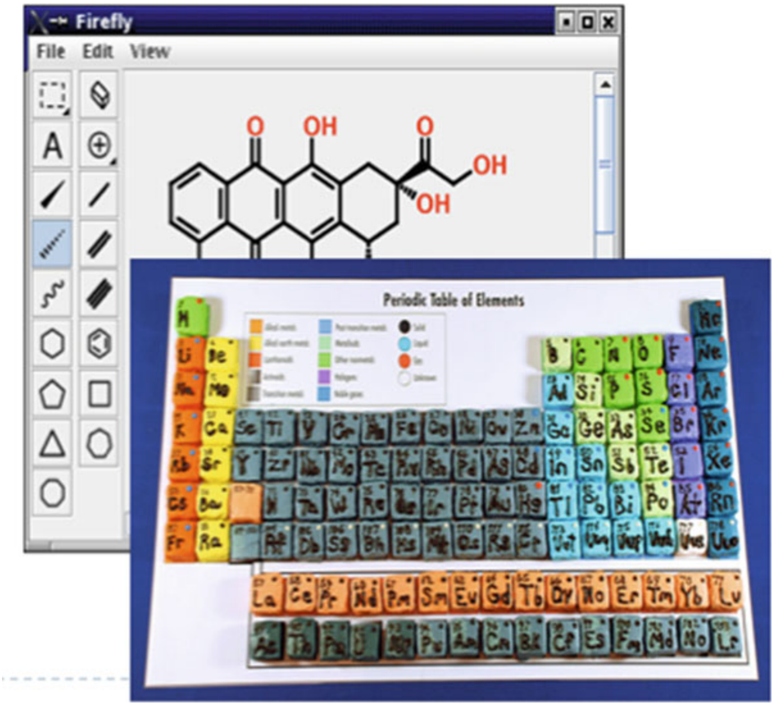

Fig. 7.5 Chemistry notations (Source: http://www.flickr.com/photos/8272941@N07/498827420/ and http://www.flickr.com/photos/chemheritage/3984920162/)

of materials, the nature of the site where the building will be located, etc. Different designs are therefore needed to relate certain elements of the design to each other while ignoring others, and these allow the designer to see their creation from different perspectives. Three-dimensional visual representations are often annotated with text and supplemented by tables of data. In recent years, design representations in architecture have been computerised with the emergence of sophisticated computer-assisted design (CAD) tools. Arguably, use of these CAD tools has influenced the practice of design, in addition to facilitating more effective sharing of designs.

Chemical Notation

Chemists use a number of design representations, from chemical symbols for individual atoms through various visual representations for displaying molecules and chemical equations for the design of chemical synthesis and for explanation of particular chemical properties (Fig. 7.5). As with music and architecture, the design representations that have been developed closely mapped to the discipline itself and the key focus of interest. Chemistry is fundamentally concerned with the properties and chemical behaviours of individual atoms and how these can combine in different ways to create molecules with different properties. Two-dimensional representations are common (e.g. chemical equations), but three-dimensional representations are also useful and particularly valuable when looking at large molecules with complex typologies. As in architecture, a number of computer-based tools have now been developed to enable drawing and manipulation of molecules. These can in some instances be based on real data, such as the atomic coordinates of individual atoms and so are also powerful modelling tools as well.

Learning Design

This section describes the emergence of learning design as a research field. This is an important and vibrant research field, and there have been a number of edited collections in recent years (Beetham and Sharpe 2007; Lockyer et al. 2008). One of the main drivers for the emergence of learning design as a research field is arguably that teachers are now presented with many choices on how they can design and deliver their courses (Agostinho 2008). They are confused by the plethora of technologies and different pedagogical approaches they can adopt. Furthermore, teachers often struggle with implementing theory into practice (Fang 1996). Kelly et al. argue that 'modern educational interventions must respond to new scientific knowledge emerging from technology-infused, Internet-intensive, highly social, networked science' (Kelly et al. 2008, p. 3).

Learning design as an approach aligns with a number of related research work, in particular research on pedagogical patterns (Goodyear and Retalis 2010) and open educational resources (Iiyoshi and Kumar 2008). The Iiyoshi and Kumar book provides an overview of the open content and knowledge movement, of which open educational resources research is one aspect. I will provide an overview of these related fields and will attempt to show how these areas are related to but also distinct from learning design. I intend to make a more explicit connection between the area of learning design, pedagogical patterns and open educational resources. See Conole et al. (2010) for more on this. I discussed aspects of this work in more detail in Chapter 3 Goodyear and Retalis (2010) provide a useful edited collection of current research in the field of pedagogical patterns. This includes a chapter by Conole and Jones (2010), which begins to align the learning design and pedagogical patterns research, through the description of a learning activity both as a visual learning design representation and as a pedagogical pattern. As discussed in Chapter 3, the work also aligns with related research in instructional design and learning sciences (Reigeluth and Carr-Chellman 2009a, b; Sawyer 2006; Spector et al. 2008).

Design is arguably the most important aspect of learning and teaching. However, design tends to be based on prior experience; practitioners make limited use of different pedagogical approaches. Effective design enables teachers to make informed use of technologies and enables them to incorporate innovative pedagogical approaches, which can meet the challenges of today's rapidly changing educational context. However, design is complex, and teachers need support and guidance to effectively incorporate new technologies, to think differently and to change their practice. This book outlines a means of achieving this, along with practical tools and methods. All of the tools and methods described are freely available.

Defining Learning Design

Learning design as a research field has emerged in the last 10 years or so, primarily driven to date by researchers in Europe and Australia. Before describing the methodology we developed at the Open University, I will provide a brief overview of the development of the field and some of the key features and milestones. The learning design research work has developed in response to a perceived gap between the potential of technologies in terms of their use to support learning and their actual use in practice (Bennett et al. 2007; Conole 2004; Herrington et al. 2005). Much of the learning design research is concerned with mechanisms for articulating and sharing practice and in particular the ways in which designs can be represented.

Learning design has developed as a means of helping teachers make informed choices in terms of creating pedagogically effective learning interventions that make effective use of new technologies. Learning design representations enable teachers to document, model and share teaching practice. Learning design also encompasses both the process of designing learning experiences as well as the product, that is, outcome or artefact of the design process.

A learning design can represent different levels of granularity—from a whole course down to an individual learning activity. In addition, it can be a formal representation, which is computer runnable, or simply a semiformal way of describing the learning intervention.

Goodyear and Yang (2008, p. 167) use the related term educational design, which they define as 'the set of practices involved in constructing representations of how to support learning in particular cases or the set of practices involved in constructing representations of how people should be helped to learn specific circumstances'. They argue that 'educational design takes time, it rarely starts with a clear complete conception of what is desired'. The process of iterative clarification of the nature of the problem and its solution involves complex thought. Goodyear (2005) also further elaborates on the definition of educational design as:

> The set of practices involved in constructing representations of how to support learning in particular cases.

This distinguishes design from development—the practices of turning these representations into real support for learning (materials, task specifications, tools, etc.). It distinguishes design for particular educational applications from the broad consideration of learning in general. It focuses on practice rather than theory while recognising that practice embodies experiential and theoretical knowledge.

Goodyear (2005) identifies three aspects of educational design. The first is the design of good learning tasks. The second is the design and management of the learning environment. The third focuses on the social aspects of learning. Goodyear and Retalis (2010) argue that good design is hard and takes time; it involves the design of good tasks but also the design of supportive learning environments. Design works indirectly; learners have the ability to adapt, customise and invent. Design works at various levels, from the detailed functionality of a tool right up to institution-wide infrastructure.

Beetham and Sharpe prefer the term 'designing for learning', which they define as:

> The process by which teachers – and others involved in the support of learning – arrive at a plan or structure or design for a learning situation. (Beetham and Sharpe 2007, p. 7)

Like Goodyear and Yang (2010), they believe that learning can never be wholly designed, only designed for (i.e. planned in advance) with an awareness of the contingent nature of learning as it actually takes place.

As shown in Fig. 7.6, Beetham (2007, p. 28) defines a learning activity as:

> A specific interaction of learner(s) with other(s) using specific tools and resources, orientated towards specific outcomes.[7]

Within this context, a learning outcome is intended to lead to some identifiable change that is anticipated in the learner. Beetham argues that because a learning activity emerges as the learner engages in a task, the elements identified are in practice highly interdependent and can only fully be defined when the activity is completed. As the figure shows, at the centre is the learning activity that the learners work through. There are four aspects to achieving this: first, the characteristics of the learners; second, the intended learning outcomes; third, the environment and associated tools and resources; and fourth, the nature of the interactions with other learners and teachers.

Chatteur et al. quoting Neal and Miller (2005), argue that e-learning design is a careful balancing act between pedagogy and technology, often at the expense of pedagogy (Chatteur et al. 2010, p. 183). They go on to argue that designing e-learning is a particularly complex task and quote Rittel and Webber (1973) arguing that design can be described as a 'wicked' problem (Chatteur et al. 2010, p. 184).

The Origins of Learning Design

The origins of the term learning design can be traced back to work at the OUNL in the Netherlands in terms of the development of a learning design (LD) specification, which subsequently translated into the IMS LD specification.[8] From a review of

[7] Derived from Beetham and Sharpe (2007, p. 29).

[8] http://www.imsglobal.org/learningdesign/

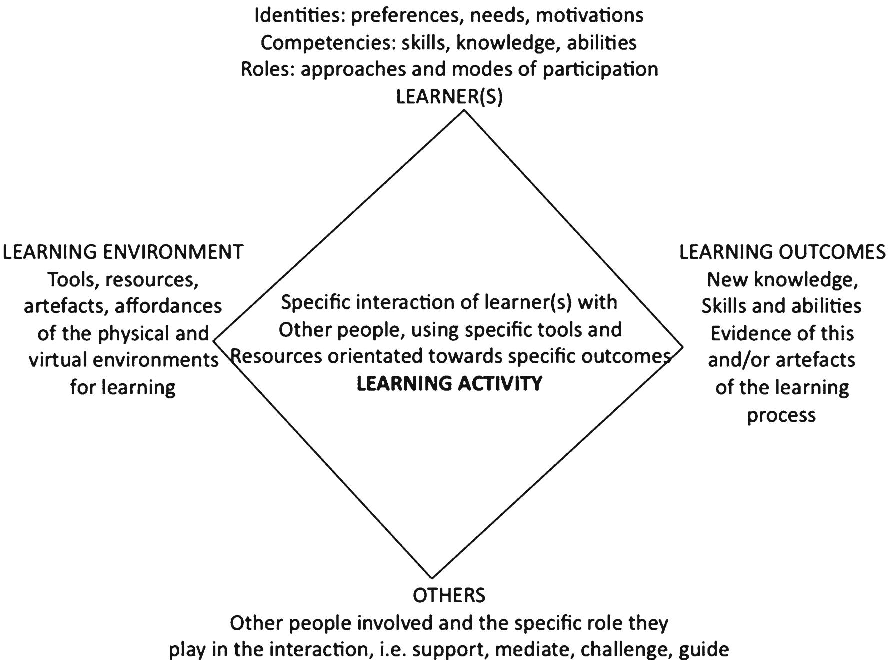

Fig. 7.6 The components involved in a learning activity

learning theories, an educational modelling language (EML) was developed (Koper and Manderveld 2004), and from this a learning design specification was derived (see, e.g. Koper and Olivier 2004; Koper and Tattersall 2005). Focusing very much at the technical level, it was claimed that the LD specification was pedagogically neutral and could be used to describe any learning intervention. The specification was based on a theatrical metaphor, describing the roles of those involved in the intervention (learners, teachers, etc.), the environment in which it occurred and the tools and resources involved. Inherent in the approach was the assumption that educational practice can be represented in a design description, that is, that underlying design ideas and principles can be captured in an explicit representation. In addition, the design of a course is driven by 'pedagogical models' that capture the teacher's beliefs and is a set of rules that prescribe how leaning can be achieved in a particular context Koper and Olivier (2004, p. 98) define learning design as:

> An application of a pedagogical model for a specific learning objective, target group and a specific context or knowledge domain.

IMS LD represents a learning design, referred to as a 'unit of learning', which is a sequence of activities described in the form of acts in a play. It is a formal computer language that both documents the final contextualised learning design and executes the learning design to the learner. It describes the roles and activity sequences within an environment of learning objects and services. Properties, conditions and notifications can also be defined to further fine-tune and specify the design. It specifies the learning-teaching process. A number of tools have since been created to run IMS LD specifications, but the work has not had a fundamental impact on changing teacher practice, focusing more on the technical description and running of the designs. These include the RELOAD LD editor,[9] the CopperCore editor,[10] Collage[11] and MOT+.[12] Botturi and Stubbs (2008) provide a more detailed description of these and other related learning design editing tools.

UML (Unified Modeling Language)[13] has also been adapted for use in e-learning contexts. Botturi et al. (2006) describe E2ML, which is based on UML, as a simple design language coupled with a visual notation system consisting of multiple interrelated diagrams. Agostinho (2008) lists three types of E2ML documents: goal definition, action diagram and overview diagram.

Since then, others have appropriated the term learning design in a much broader sense, shifting to the notion of 'designing for learning'. Cross and Conole (2008) provide a simple overview of the field; see also Conole and Galley (2011). The focus of the research is to both better understand and represent design processes, along with developing tools and methods to help practitioners create better designs. A number of benefits of adopting a more formal and rigorous approach to design have been identified (Conole 2009). In terms of the OULDI research work, we define learning design as:

> A methodology for enabling teachers/designers to make more informed decisions in how they go about designing, which is pedagogically informed and makes effective use of appropriate resources and technologies. This includes the design of resources and individual learning activities right up to whole curriculum level design. A key principle is to help make the design process more explicit and shareable. Learning design as an area of research and development includes both gathering empirical evidence to better understand the design process as well as the development of a range of resource, tools and activities.

In parallel, work in Australia embraced a broader notion of the term 'learning design', which was located more at the level of practice than technical specification. The AUTC Learning Design project[14] aimed to capture a range of pedagogical models as learning design case studies with the intention that these could then be used by teachers to guide their practice and enable greater sharing and reuse of designs (Agostinho 2008; Oliver, et al. 2002).

The work was based on a framework for describing learning designs developed by Oliver and Harrington (Oliver 1999; Oliver and Herrington 2001). This was based on three critical elements: learning tasks, learning resources and learning support. The intention was that thinking about each of these elements helped to both

[9] http://www.reload.ac.uk/ldeditor.html

[10] http://coppercore.sourceforge.net/

[11] http://www.gsic.uva.es/collage/

[12] http://www.cogigraph.com/Produits/MOTetMOTplus/tabid/995/language/en-US/Default.aspx

[13] http://www.omg.org/spec/UML/2.0/

[14] http://www.learningdesigns.uow.edu.au/

guide the design process and make it explicit and shareable. The approach was used to represent a range of learning designs across different pedagogical models, such as role play, problem-based learning, concept-based learning and collaboration. The AUTC LD project produced detailed guidelines on each of the design case studies they captured, representing these visually using an updated version of the design representation developed by Oliver and Harrington, along with detailed descriptions on how the design was produced and how it can be used. A number of studies have been conducted exploring how the AUTC designs are actually used by teachers.

Buzza et al. (2004) focused on the 'predict-observe-explain' AUTC design[15] with four teachers and two instructional designers. Overall, the participants recognised the value of the designs and how they might be used, although the researchers concluded that widespread adoption of the IMS Learning Design specification would not be possible until a controlled vocabulary can be agreed upon for use in cataloguing and searching for learning designs. Agostinho et al. (2009) explored to what extent the AUTC designs were effective learning design descriptions, that is, how they could provide adequate information that can be easily understood in terms of content and thus potentially reused by a teacher in their own particular educational context. Their findings were that there are three important features of an effective learning design description: (1) a clear description of the pedagogical design, (2) some form of 'quality' rating and (3) guidance and advice on how the design could be reused.

In the UK, the Joint Information Systems Committee (JISC) funded a series of projects under the 'design for learning programme' (see Beetham 2008 for a review of the programme and the lessons learnt). The term 'design for learning' was used rather than learning design to indicate a broader scope and a more holistic approach, although I would argue that the way in which I define learning design in this book is synonymous with this broader perspective. Design for learning was defined as:

> A set of practices carried out by learning professionals … defined as designing, planning and orchestrating learning activities which involve the use of technology, as part of a learning session or programme. (Beetham 2008, p. 3)

The programme included a review of e-learning pedagogical models, which classified learning theories into three main types: associative, constructive and situative (Mayes and DeFreitas 2004). The Mod4L project[16] explored what different types of design presentations were being used by practitioners and concluded that decontextualised designs or patterns could not in practice form the basis of a generic design typology, in which a finite number of educationally meaningful intentions could be discerned (Falconer et al. 2007).

The programme also supported the development of two pedagogical planner tools, Phoebe (Masterman 2008b) and the London Pedagogical Planner (these are discussed in Chapter 10). The programme divided the design life cycle into four parts: design, instantiation, realisation and review. The granularity of the designs

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[15] http://www.learningdesigns.uow.edu.au/exemplars/info/LD44/index.html

[16] http://www.academy.gcal.ac.uk/mod4l/

ranged from the design of learning objects or short learning activities up to broader sessions or whole courses/curricula. Beetham (2008) described some of the key lessons derived from the programme including the following. Firstly, design practices are varied, depending on individuals, subject differences and local cultures. Secondly, design tools are rarely perceived as pedagogically neutral, and most are not considered flexible enough to match real practice. Finally, there were mixed views from practitioners on what were the most appropriate ways of representing and sharing designs—some wanted rich, narrative representations and others wanted bite-sized representations that could be easily understood and reused.

A Spectrum of Learning Design Languages

Agostinho (2008, p. 14) reviewed commonly used learning design languages categorising them as follows:

1. Pedagogical patterns
2. Generic learning designs—patterns and generic learning design visualisation sequences (LDVS)
3. Contextualised learning design instantiations—LDVS, LDLite and E2ML
4. Executable runnable versions—IMS LD, LAMS

Agostinho et al. (2008) argue that the AUTC visual learning design representation can be used to facilitate dissemination and reuse of innovative pedagogical strategies in university teaching. Agostinho (2008) also refer to this as a learning design visual sequence (LDVS). It is intentionally aimed at teachers as an easy to understand representation. It can be used to both represent and share examples of good designs or help guide a teacher through the creation of a learning design.

Harper and Oliver (2008, p. 228) developed a taxonomy for learning designs arising out of the AUTC Learning Design project[17], which gathered over 50 exemplar learning designs. The AUTC designs were categorised into five types of design: collaborative designs, concept/procedure designs, problem-based learning designs, project/case study designs and role play designs. As discussed earlier, the AUTC design language is much more practitioner oriented than IMS LD. It is based on work by Oliver and Herrington (2001), who identified three elements associated with a learning design:

1. The tasks or activities learners are required to undertake
2. The content resources provided to help learners complete the tasks
3. The support mechanisms provided to assist learners to engage with the tasks and resources

[17] http://www.learningdesigns.uow.edu.au/

These three elements are used to describe a learning design, as a temporal sequence, with the tasks or activities being undertaken in the centre and the associated resources and support mechanism for each tasks or activity represented either side. These are represented by three symbols: squares (tasks), triangles (resources) and circles (support). Figure 7.7 shows an example, from the Mekong e-Sim role play design.[18] It shows the content or resources the learners interact with on the left-hand side, the tasks or activities that the learners are required to perform in the middle and the support mechanisms provided to assist learners in engaging with the tasks and resources on the right-hand side. Harper and Oliver (2008) argue that there has been little work to provide a means to classify and categorise learning designs. The designs were evaluated using an adapted version of the framework developed by Boud and Prosser (2002), based on the following criteria: learner engagement, acknowledgement of the learning context, learner challenge and the provision of practice. They identified the following four types of learning design:

1. Rule focus—based on the application of rules
2. Incident focus—based on incidents and events
3. Strategy focus—that requires strategic thinking, planning and activity
4. Role focus—where the learning outcomes are based on learners' performance and personal experiences

Another simple representation, also aimed at teachers, is LDLite (Oliver and Littlejohn 2006), which shares many similarities with lesson plans that K-12 teachers are familiar with. It is based on five aspects of a design: tutor roles, learner roles, content resources, service resources and assessment feedback. It consists of a matrix which has the following as column headings: tutor role, student role, resources (content), resources (services) and assessment feedback. The rows describe each of these in terms of the online and offline elements of the learning intervention.[19]

The MOT+ design language is based on the MISA instructional design method (Paquette 2004; Paquette et al. 2008). It starts from the premise that building a design is based on two fundamental questions. What knowledge do we want the learners to acquire? How should the activities and resources best be organised to achieve this? It is a graphical representation, which consists of three elements: concepts, procedures and principles.

The Learning Activity Management System (LAMS), like IMS LD, is a computer-runnable design language (Dalziel 2003, 2007). The main strength of the LAMS tool is that it provides a simple visual representation of the design, based around the tools and activities that the learning design is comprised of. It is intentionally aimed as a tool for use by practitioners and has been used extensively by teachers across different educational sectors. The learning design is represented as a sequence of activities visually illustrated as a flow chart. In contrast to the AUTC

[18] http://www.learningdesigns.uow.edu.au/exemplars/info/LD42/more/03Context.html

[19] See learning design—LDLite.

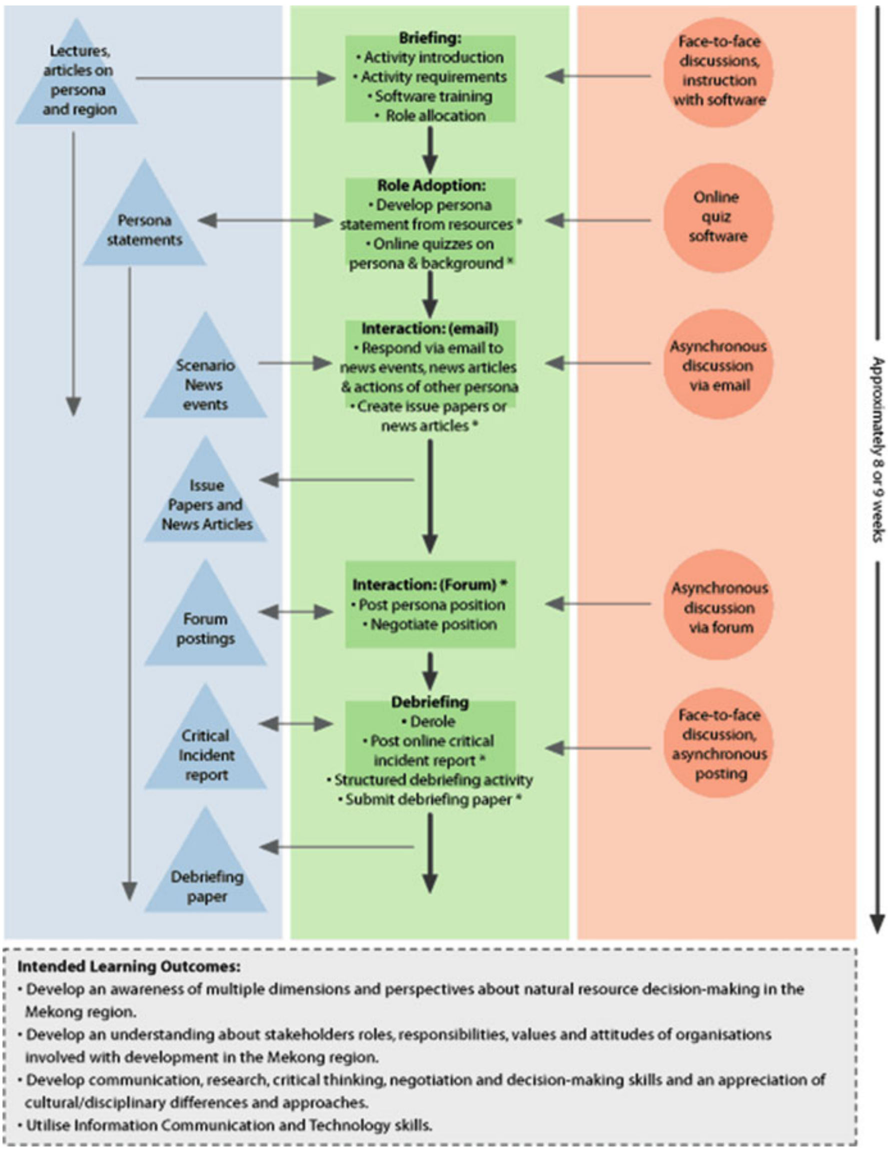

Fig. 7.7 The Mekong e-Sim learning design: an example of the AUTC learning design visualisation

temporal sequence, LAMS sequences are usually represented from left to right. Examples of LAMS tools include typical teaching activities such as chat, question and answer and forum. However, because it is designed to be runnable, one of the weaknesses of LAMS is that it focuses the design around tools and does not take account of all the other aspects involved in a learning activity. LAMS is discussed in more detail in Chapter 9.

A closely related body of work to learning design is research into the development and use of pedagogical patterns. This is discussed in more detail in Chapter 3 derived from Alexander's work in architecture (Alexander 1977; Alexander et al. 1977), pedagogical patterns is an approach to developing structured case studies of good practice (see, e.g. Goodyear 2005 for an outline of the field). Although of a slightly different nature to the other design languages described above, pedagogical patterns (Goodyear 2005; Goodyear and Retalis 2010) can also be viewed as a form of design language. Patterns consist of the following elements: pattern name, context for the pattern, description of the problem to be solved, solution, examples and links to related patterns.

The Open Learning Design Methodology

The OU Learning Design Initiative

The OU Learning Design Initiative (OULDI)[20] emerged from previous work on the development of a learning design toolkit, DialogPlus (Conole and Fill 2005; Fill et al. 2008). Like the Phoebe and the London Pedagogical Planner (LPP) tools, DialogPlus was intended to act as a step-by-step guide to enable teachers to create learning designs.[21] The tool was based on an underlying taxonomy, which defined the components of a learning activity (Conole 2008), which was derived through a series of interviews with teachers about their design practices. However, evaluation of the actual use of such design planner tools indicated that they did not match actual design practice closely enough. Their relatively linear and prescriptive structure did not match the creative, iterative and messy nature of actual teacher design practice.

The OU Learning Design Initiative was initiated in 2007, supported through strategic funding from the OU and later through funding from the EU and JISC. The intention was to derive a more practice-focused approach to learning design, identified from empirical evidence of actual practice. This included gathering 43 case studies of the ways in which the then new learning management system (LMS), Moodle,[22] was being used at the Open University UK (Wilson 2007) and a series of interviews with teachers to articulate their actual teaching practice (Clark and Cross 2010). The key focus of the teacher interviews was to better understand existing practice. The authors note in their introduction that:

> Even experienced academics who have participated in a range of course production tasks find it difficult to articulate how they go about developing a 'learning design' that will be transformed into effective learning materials (Clark and Cross 2010).

[20] http://ouldi.open.ac.uk

[21] These pedagogical planner tools are discussed in Chapter 10.

[22] http://moodle.org/

The interviews focused on five main questions: (1) process: how teachers go about designing a course, (2) support: how they generate ideas, (3) representation: how they represent their designs, (4) barriers: what barriers they encounter and (5) evaluation: how they evaluate the effectiveness of the design.

A range of approaches to design was evident from the interviews, including gathering of resources, brainstorming, listing concepts and skills, creating week-by-week plans, etc. On the whole, these were paper based and primarily text based. There was little evidence of use of alternative, more visual representations or visual software tools. Interviewees wanted help with understanding how to integrate ICT-based activities into courses. Face-to-face workshops and meetings were favoured over online support as they were felt to be the most effective way of thinking about and absorbing new ideas and ways of working. Case studies interestingly were considered to be too demanding in time and effort; interviewees wanted just-in-time support to specific queries. The most effective form of support was considered to be sharing of experience with peers.

Although text-based representations predominated, a variety of representations were mentioned from simple textual representations or lists to more complex and connected mind maps. The interviewees listed a variety of purposes for the representations, including communicating personal vision, capturing or sharing ideas, comparing with others, viewing the course at different levels and mapping content to learning outcomes.

Barriers included concerns about a lack of experience of creating online activities and a lack of successful examples to draw on. An OU-specific issue was mapping the innovative (and often idiosyncratic) ideas of course creators, with the needs of a production system delivering the OU's size and range of learning materials and services.

A range of mechanisms was cited in terms of evaluation approaches. These included feedback from students and tutors, comments from critical readers, peer course team critiques and comments from external examiners.

This empirical work provided a sound basis for the development of our approach. Our initial focus centred on the following questions:

- How can we capture and represent practice (and in particular innovative practice)?
- How can we provide 'scaffolds' or support for staff in creating learning activities that draws on good practice, making effective use of tools and pedagogies (Conole 2009)?

We identified six reasons why adopting a learning design approach might be beneficial:

1. It can act as a means of eliciting designs from academics in a format that can be tested and reviewed with developers, that is, a common vocabulary and understanding of learning activities.
2. It provides a means by which designs can be reused, as opposed to just sharing content.

3. It can guide individuals through the process of creating learning interventions.
4. It creates an audit trail of academic design decisions.
5. It can highlight policy implications for staff development, resource allocation, quality, etc.
6. It aids learners in complex activities by guiding them through the activity sequence.

These map closely with the benefits of adopting a design-based research (DBR) approach outlined by Gibbons and Brewer (2005). They argue that the benefits include improving the rate of progress (in the creation of designs), influencing the designer conceptions through making the design process explicit, helping to improve design processes, improvements in design and development tools and bringing design and production closed together. Fundamentally, I would agree with their assertion that it opens up new ways of thinking about designs and designing and in particular helps practitioners to shift from a focus on content to the activities the students will undertake.

We see 'learning design' as an all-encompassing term to cover the process, representation, sharing and evaluation of designs from lower-level activities right up to whole curriculum level designs. In previous work (Conole and Jones 2010), we identify three levels of design—micro, meso and macro—drawing on Bielaczyc (2006) and Jones (2007). In our terms, the micro-level refers to learning activities (typically a few hours' worth of activity), the meso-level to aggregations of activities or blocks of activities (weeks or months worth of activity) and the macro-level to whole curriculum designs. As part of their Curriculum Design programme,[23] the Joint Information Systems Committee (JISC) provides the following definition in terms of curriculum (JISC n.d.):

> Curriculum design is generally understood as a high-level process defining the learning to take place within a specific programme of study, leading to specific unit(s) of credit or qualification. The curriculum design process leads to the production of core programme/module documents such as a course/module description, validation documents, prospectus entry, and course handbook. This process involves consideration of resource allocation, marketing of the course, and learners' final outcomes and destinations, as well as general learning and teaching approaches and requirements. It could be said to answer the questions 'What needs to be learned?', 'What resources will this require?', and 'How will this be assessed?'

We were interested in a number of research questions in particular. Can we develop a range of tools and support mechanisms to help teachers design learning activities more effectively? Can we agree on a shared language/vocabulary for learning design which is consistent and rigorous but not too time consuming to use? How can we provide support and guidance on the creation of learning interventions? What is the right balance of providing detailed, real case studies which specify the detail of the design compared with more abstract design representations that

[23] http://www.jiscinfonet.ac.uk/curriculum

simply highlight the main features of the design? How can we develop a sustainable community of reflective practitioners who share and discuss their learning and teaching ideas and designs?

Design-Based Research (DBR)

The next section describes the OULDI methodology, which is based on design-based research (DBR). This section provides a brief overview of design-based research. This section draws in particular on Barab (2006) and Kelly et al. (2008).

Design-based research (DBR) has emerged in recent years as an approach for studying learning in context through systematic design and study of instructional strategies and tools (Brown 1992; Collins 1992 cited in Design-Based Research Collective 2003). Wang and Hannafin (2005, pp. 5–6) define it as ‘a systematic, but flexible methodology aimed to improve educational practice through iterative analysis, design, development and implementation, based on collaboration between researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories’.

Barab provides a useful overview of design-based research (Barab 2006, p. 155). He argues that the value of design-based research (DBR) is that it offers a methodology for dealing with the complexity of real learning contexts by ‘iteratively changing the learning environment over time—collecting evidence of the effect of these variations and feeding it recursively into future designs’ (citing Brown 1992; Collins 1992). He argues that cognition, ‘rather than being a disembodied process occurring in the confines of the mind, is a distributed process spread out across the knower, the environment, and even the meaning of the activity’ (citing Salomon 1993). Barab suggests that DBR can yield rich insights into the complex dynamics whereby theories become contextualised. He lists the following as mechanisms for making DBR effective:

1. Make the assumptions and theoretical bases that underlie the work explicit.
2. Collect multiple types of theoretically relevant data.
3. Conduct ongoing data analysis in relation to theory.
4. Invite multiple voices to critique theory and design.
5. Have multiple accountability structures.
6. Engage in dialectic among theory, design and extant literature.

He argues that DBR has the following characteristics: design, theory and a problem in the context of a naturalistic setting, involving multiple iterations or progressive refinement (Fig. 7.8). The figure shows the relationship between the underlying theory, design and problem being investigated within a naturalistic context and how this iterates and evolves over time. Kelly et al. (2008, p. 5) suggests that DBR foregrounds ‘the fluid, empathetic, dynamic, environment-responsive, future-orientated and solution-focused nature of design’.

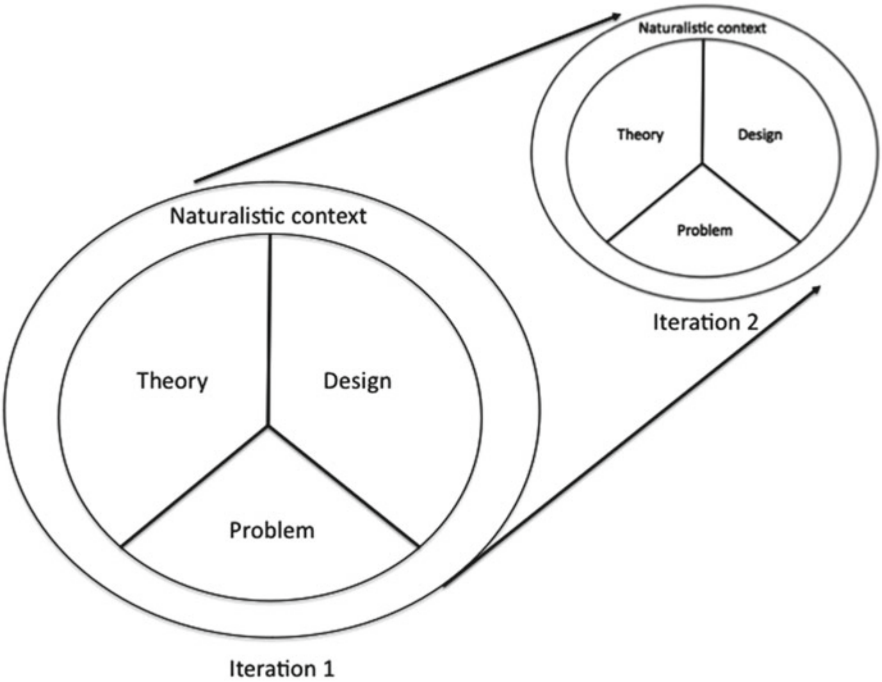

Fig. 7.8 The interactive nature of design-based research

The OULDI Learning Design Methodology

We have adopted a design-based research (DBR) approach, starting with a stated problem we were trying to address, a proposed solution and then an iterative cycle of developments and evaluation. Reigeluth and An (2009, pp. 378–379) articulate a set of characteristics of DBR, which are listed below. The way in which the OULDI learning design methodology maps to these is described:

1. DBR is driven by theory and prior research. In our work, we are building on the substantive body of prior research on instructional design, the learning sciences, learning objects/open educational resources, pedagogical patterns and more recently learning design. As discussed in Chapter 5, the approach we adopt is sociocultural in nature, with a focus on the design and use of a range of mediating artefacts involved in the learning-teaching processes (see Conole 2008 for a more detail account of this).
2. It is pragmatic. Our aim is to develop tools and resources which are useful to practitioners in actual practice, to address real educational challenges. Our intention is to be theory driven, but pragmatic, recognising the complex, messy and often craft-based nature of teaching practice.

3. It is collaborative. We see working in close connection with end users as a vital part of our approach. Our initial interviews with teachers confirmed our view that teaching practice is complex and situated. Furthermore, it is evident that design is not a linear process; it is creative, iterative and messy. Changing practice will only occur through close working with and understanding of practitioners' needs.
4. It is contextual. Our vision is to change actual practice; to achieve this, it is important that the development activities occur in real, authentic contexts.
5. It is integrative. Wang and Hannafin (2005, p. 10) state that 'DBR uses a variety of research methods that vary as new needs and issues emerge and the focus of the research evolves'. We have adopted a mixed-method approach to evaluating our developments, matching the methods we use to the specific sub-research questions and the context that we are focusing on.
6. It is iterative. Our approach consists of an interactive cycle of identification of problems to be addressed, suggestion of proposed solutions, development, use, evaluation and refinement.
7. It is adaptive and flexible. Because our work is closely tied to actual practice, we need to ensure that the approach we are adopting is agile in nature so that we can adapt based on evidence from changing practice.
8. It seeks generalisation. In addition to the practical, pragmatic nature of our work, we are also attempting to develop a coherent underlying learning design framework of concepts and approaches.

In essence, we are focusing on three aspects of design: (1) the development of a range of conceptual tools to guide the design process and provide a means of representing (and hence sharing) designs, (2) the development of visual tools to render some of the conceptual tools and enable practitioners to manipulate their designs and share them digitally with others and (3) the development of collaborative tools—both in terms of structures for face-to-face events, such as workshops and the use of digital tools, to foster communication and sharing.

For each aspect, we have now developed a set of tools, resources and activities, and over the last few years, we have been trialling these in a range of settings, both with the OU and also externally with a number of partner institutions and through demonstrations and workshops at conferences. It would be impossible in the scope of this book to describe all the tools, resources and activities in detail; hence, a selection will be described to give an overall view of the work to date. An evolving online learning design toolkit is being developed which includes our current set of tools, resources and activities.[24] In addition, a learning activity taxonomy has been developed (Conole 2008) and more recently a learning design taxonomy which provides a map of the domain, the key concepts and where individual tools, resources and activities fit (Conole 2010).

[24] http://cloudworks.ac.uk/cloudscape/view/1882

OULDI aims to bridge the gap between the potential and actual use of technologies outlined in the introduction, through the development of a set of tools, methods and approaches to learning design, which enables teachers to making better use of technologies that are pedagogically informed. Conole (2009) provides a reflection on the origins of OULDI and the benefits of adopting this approach. The aim is to provide a design-based approach to the creation and support of learning and teaching and to encourage a shift away from the traditional implicit, belief-based approaches to design-based, explicit approaches. This will encourage sharing and reflection. The tools and resources are designed to help guide decision-making. The work is underpinned by an ongoing programme of empirical evidence, which aims to gain a better understanding of the design process and associated barriers and enablers, as well as an ongoing evaluation of the tools, methods and approaches we are developing and using and in particular to what extent they are effective.

There are three aspects to the OULDI: a set of visual design representations, a set of resource and activities, and mechanisms for fostering social interaction.

In terms of visual representations, we have created five views: a course view map (which provides an 'at a glance' overview of a course), a course dimensions view (which provides more details on the nature of the course—the degree to which it is collaborative, the level and forms of assessment, the amount of inclusion of user-generated content or experience), a pedagogy profile view (which articulates the types of and amount of learner tasks), a learning outcomes map (which maps learning outcomes to activities and assessment) and a task swimlane view (which maps the tasks the learners undertake to the resources and tools they use). These are discussed in more detail in the next chapter.

In terms of resources and activities, we have now created a rich set of these to support design practice. This includes use of the visual representations in a range of activities, as well as a number of other activities such as getting practitioners to think of the characteristics (affordances) of technologies in terms of how they might be used to support different pedagogical approaches.

Finally, to facilitate social interaction, we have created a range of workshops as well as an online social networking site for learning and teaching, Cloudworks. The workshop include 'Technology lite' workshops where participants consider the characteristics of different technologies and how they might be used in their teaching, workshops on the use of the visualisation tools and a 'Design Challenge' workshop where participants work in teams to create a course in a day, assisted by a range of 'expert stalls' who provide advice on a range of topics (such as using Web 2.0 tools, collaborative learning, assessment and the use of OER). The 'Design Challenge' workshop is similar in nature to the Carpe Diem workshop format (BDRA 2011). Carpe Diem is described as a creative learning design process. At the end of the workshop, participants have a blueprint and a storyboard for the course, a set of peer-reviewed e-tivities, a model for further development and an action plan.

Cloudworks is a social networking site to facilitate the sharing and discussion of learning and teaching ideas and designs. It combines social and participatory functionality to enable multiple forms of communication, collaboration and cross-boundary interactions among different communities of users. The core object in the site is a Cloud, which can be anything to do with learning and teaching, such as a description of a learning intervention, a description of a tool or resource, a question or a discussion point. Clouds can be grouped into Cloudscapes; a Cloud can belong to more than one Cloudscape. Clouds are a combination of social and participatory functionality. Firstly, they act like a multi-user blog; anyone can start a Cloud and others can sequentially add content to it. Secondly, they have a space for discussion. Thirdly, users can enrich the Cloud by adding embedded content, tags, links and references. Finally, they have additional Web 2.0 functionality, such as an activity stream for the Cloud, the ability to tag, RSS feeds and Twitter-like follow and be-followed options.

Conclusion

This chapter has focused on the range of design languages that can be used to guide and represent learning designs. It has provided a rationale for the value of design languages and their uses. It has described a range of design languages as a means of illustrating their variety and the ways in which they can be used for different purposes. It has shown that some are available as computer tools, while others are simply conceptual in nature.

Design languages help make the design practice more explicit and hence shareable. They provide practitioners with scaffolded guidance on the design process and promote critical thinking and reflection. By externalising the design, a teacher is better able to get an overview of the whole design and hence be able to see how the different elements of the design are connected and also to identify potential gaps or weaknesses in the design.

In the next chapter, I will show how we have developed a range of design representations to foreground different aspects of the design process and will describe how these representations can be used. I will illustrate how these designs are being used by teachers and show how we have contextualised them in a range of different types of activities and workshops. In addition, in Chapter 9, I will describe a range of design tools that have been developed, including a learning design tool that we have developed, CompendiumLD, that enables teachers to create and share designs. In Chapter 15, I will also describe the social networking tool, Cloudworks[25] that we have developed, which acts as a space for teachers to share and discuss learning and teaching ideas, and also describe the types of user behaviour that are emerging in the site.

[25] http://cloudworks.ac.uk

References

Agostinho, S. (2008). Learning design representations to document, model, and share teaching practice. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies* (pp. 1–19). Hershey/New York: Information Science Reference.

Agostinho, S., Harper, B., Oliver, R., Hedberg, J., & Wills, S. (2008). A visual learning design representation to facilitate dissemination and reuse of innovative pedagogical strategies in university teaching. In L. Botturi & S. T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 380–393). Hershey/New York: Information Science Reference.

Agostinho, S., Bennett, S. J., Lockyer, L., Kosta, L., Jones, J., & Harper, B. (2009, December 7–9). An examination of learning design descriptions in a repository. In R. Atkinson & C. McBeath (Eds.), *Same Places, Different Spaces. Proceedings of the 26th Annual Ascilite International Conference* (pp. 11–19). Auckland: University of Auckland/Auckland University of Technology/Australasian Society for Computers in Learning in Tertiary Education. Available online at http://www.ascilite.org.au/conferences/auckland09/?m=Programmeands=Programme. Accessed 11 Aug 2011.

Alexander, C. (1977). *Pattern languages*. New York: Oxford University Press.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction* (Vol. 2). New York: Oxford University Press.

Barab, S. (2006). Design-based research – A methodological toolkit for the learning scientist. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 153–169). Cambridge: Cambridge University Press.

BDRA. (2011, October 5). *Openness and learning design*. BDRA blog post. Available online at http://beyonddistance.wordpress.com/2011/10/05/openness-and-learning-design/. Accessed 7 Oct 2011.

Beetham, H. (2007). An approach to learning activity design. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning* (pp. 26–40). London: Routledge.

Beetham, H. (2008). *Review of the design for learning programme phase 2* (JISC Design for Learning programme report). Available online at http://www.jisc.ac.uk/elp_designlearn.html. Accessed 11 Aug 2011.

Beetham, H., & Sharpe, R. (Eds.). (2007). *Rethinking pedagogy for a digital age: Designing and delivering e-learning*. London: RoutledgeFalmer.

Bennett, S. J., Agostinho, S., Lockyer, L., Kosta, L., Jones, J., Koper, R., & Harper, B. (2007, December 2–5). Learning designs: Bridging the gap between theory and practice. In R. Atkinson, C. McBeath, S. Soong, & C. Cheers (Eds.), *Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education* (pp. 51–60). Singapore: Nanyang Technological University. Available online at http://www.ascilite.org.au/conferences/singapore07/procs/bennett.pdf. Accessed 11 Aug 2011.

Bielaczyc, K. (2006). Designing social infrastructure: Critical issues in creating learning environments with technology. *The Journal of the Learning Sciences, 15*(3), 301–329.

Boling, E., & Smith, K. M. (2008). Artifacts as tools in the design process. In D. Merrill & M. Spector (Eds.), *Handbook of research in educational communications and technologies* (3rd ed.). New York: Tailor and Francis.

Botturi, L. (2008). E2ML: A tool for sketching instructional design. In L. Botturi & S. T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 112–132). Hershey/New York: Information Science Reference.

Botturi, L., & Stubbs, T. (2008). *Handbook of visual languages for instructional design: Theories and practice*. Hershey: IGI Global.

Botturi, L., Derntl, M., Boot, E., & Figl, K. (2006, July 5–7). *A classification framework for educational modelling languages in instructional design*. Paper presented at the ICALT 2006, Kerkrade, the Netherlands.

Boud, D., & Prosser, M. (2002). Appraising new technologies for learning: A framework for development. *Educational Media International, 39*(3–4), 237–245.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences, 2*(2), 141–178.

Buzza, D. C., Bean, D., Harrigan, K., & Carey, T. (2004). Learning design repositories: Adapting learning design specifications for shared instructional knowledge. *Canadian Journal of Learning and Technology*, *30*(3), 79–102. Available online at http://www.cjlt.ca/content/vol30.3/buzza.html. Accessed 11 Aug 2011.

Chatteur, F., Carvalho, L., & Dong, A. (2010). Embedding pedagogical principles and theories into design patterns. In P. Goodyear & S. Retalis (Eds.), *Technology-enhanced learning: Design patterns and pattern languages* (pp. 183–200). Rotterdam: Sense.

Clark, P., & Cross, S. (2010). *Findings from a series of staff interviews about learning design, representations of design, design process, evaluation and barriers, Appendix 2*. The OU Learning Design Initiative Project Phase Two Report, Embedding learning design and establishing a reversioning culture. Milton Keynes: The Open University.

Cole, M., Engeström, Y., & Vasquez, O. A. (1997). *Mind, culture and activity: Seminal papers from the laboratory of comparative human cognition*. Cambridge: Cambridge University Press.

Collins, A. (1992). Towards a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in educational technology* (pp. 15–22). New York: Springer.

Conole, C. (2004). E-learning: The hype and the reality. *Journal of Interactive Media in Education, 2004* (12). Available online at http://www-jime.open.ac.uk/2004/12. Accessed 11 Aug 2011.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies*. Hershey: IGI Global.

Conole, G. (2009). Capturing and representing practice. In A. Tait, M. Vidal, U. Bernath, & A. Szucs (Eds.), *Distance and e-learning in transition: Learning innovation, technology and social challenges*. London: Wiley.

Conole, G. (2010, June 28–July 2). *Learning design – Making practice explicit*. Invited keynote. ConnectEd Conference, Sydney. Available online at http://cloudworks.ac.uk/cloud/view/4001. Accessed 11 Aug 2011.

Conole, G., & Fill, K. (2005). A learning design toolkit to create pedagogically effective learning activities. In C. Tattersall (Ed.), *Journal of Interactive Multimedia Education* (Special issue on learning design). Available online at http://jime.open.ac.uk/2005/08/. Accessed 11 Aug 2011.

Conole, G., & Galley, R. (2011). *Learning design – A learning and teaching guide*. Milton Keynes: The Open University.

Conole, G., & Jones, C. (2010). Sharing practice, problems and solutions for institutional change – Comparing different forms of representation. In P. Goodyear & S. Retalis (Eds.), *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers B.V.

Conole, G., McAndrew, P., & Dimitriadis, Y. (2010). The role of CSCL pedagogical patterns as mediating artefacts for repurposing open educational resources. In F. Pozzi & D. Persico (Eds.), *Techniques for fostering collaboration in online learning communities: Theoretical and practical perspectives*. Hershey: IGI Global.

Cross, S., & Conole, G. (2008). *Learn about learning design* (Learn about guides series). Milton Keynes: The Open University. Available http://ouldi.open.ac.uk/Learn%20about%20learning%20design.pdf. Accessed 11 Nov 2009.

Dalziel, J. (2003, December 7–10). Implementing learning design: The learning activity management system (LAMS). In *Proceedings of the ASCILITE conference*. Available online at http://www.ascilite.org.au/conferences/adelaide03/program/conf_prog_index.htm. Accessed 11 Aug 2011.

Dalziel, J. (2007). Building communities of designers. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning* (pp. 193–206). London: Routledge.

Dalziel, J. (2009). Prospects for learning design research and LAMS. *Teaching English with Technology, 9*(2). Available online at http://iatefl.org.pl/call/j_forward35.pdf. Accessed 20 Sept 2011.

Derntl, M., Parish, P., & Botturi, L. (2008, June 30–July 4). Beauty and precision in instructional design. In *Proceedings of the Edmedia conference*, Lugano, Italy.

Derntl, M., Parrish, P., & Botturi, L. (2010). Beauty and precision: Weaving complex educational technology projects with visual instructional design languages. *International Journal on E-Learning, 9*(2), 185–202.

Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32*(1), 5–8.

Donald, C., & Blake, A. (2009, December 7–9). Reviewing learning designs with HEART: A learning design support strategy. In *Proceedings of the ASCILITE Conference*, Auckland. Available online at http://www.ascilite.org.au/conferences/auckland09/?m=Programme&s=Programme. Accessed 11 Aug 2011.

Donald, C., Blake, A., Girault, I., Datt, A., & Ramsay, E. (2009). Approaches to learning design: Past the head and the hands to the HEART – of the matter. *Distance Education, 30*(2), 179. Available online at http://www.informaworld.com/110.1080/01587910903023181. Accessed 11 Aug 2011.

Falconer, I., & Littlejohn, A. (2008). Representing models of practice. In L. Lockyer, S. Bennet, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies*. Hersey: IGI Global.

Falconer, I., Beetham, H., Oliver, R., Lockyer, L., & Littlejohn A. (2007). *Mod4L final report: Representing learning designs*. Available online at http://mod4l.com/tiki-download_file.php?fileId=7. Accessed 11 Aug 2011.

Fang, Z. (1996). A review of research on teacher beliefs and practices. *Educational Research, 38*(1), 47–65.

Fill, K., Conole, G., & Bailey, C. (2008). A toolkit to guide the design of effective learning activities. In P. Rees, L. Mackay, H. Durham, & D. Martin (Eds.), *E-learning for geographers: Online materials, resources, and repositories* (pp. 170–184). Hershey: IGI Global.

Gibbons, A. S., & Brewer, E. K. (2005). Elementary principles of design languages and design notation systems for instructional design. In J. M. Spector, C. Ohrazda, A. V. Schaack, & D. A. Wiley (Eds.), *Innovations in instructional technology*. Mahwah: Lawrence Erlbaum Associates.

Gibbons, A. S., & Brewer, E. K. (2007). Elementary principles of design languages and design notation systems for instructional design. In J. M. Spector, C. Ohrazda, A. Van Schaack, & D. Wiley (Eds.), *Innovations to instructional technology: Essays in honor of M. David Merrill* (pp. 111–129). Mahwah: Lawrence Erlbaum Associates.

Gibbons, A. S., Botturi, L., Boot, E., & Nelson, J. (2008). Design languages. In M. Discoll, M. D. Merill, Jv Merrienboer, & J. M. Spector (Eds.), *Handbook of research for educational communications and technologies*. Mahwah: Lawrence Erlbaum Associates.

Goldschmidt, B. (1991). The dialectics of sketching. *Creativity Research Journal, 4*(2), 123–143.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology, 21*(1), 82–101.

Goodyear, P., & Retalis, S. (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers.

Goodyear, P., & Yang, D. F. (2009). Patterns and pattern languages in the educational design. In L. Lokyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, Applications and technologies* (pp. 167–187). Hershey PA: Information Science Reference.

Goodyear, P., & Yang, D. F. (2008). Patterns and pattern languages: Supporting understanding and performance in educational design. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies*. Hersey: IGI Global.

Harper, B., & Oliver, R. (2008). Developing a taxonomy for learning designs. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies*. Hersey: IGI Global.

Herrington, J., Reeves, T., & Oliver, R. (2005). Online learning as information delivery: Digital myopia. *Journal of Interactive Learning Research, 16*(4), 353–367.

Hernández-Leo, D., Villasc laras-Fernández, E.D., Ascensio-Pérez, J., Dimitriadis, I., Jorrín-Abeltán, I. M., Ruiz-Pequies, I., & Rubia-Avi, B. (2006). COLLAGE: A collaborative learning design editor based on patterns. *Education Technology and Society, 9*(1), 58–71.

Hohanson, B., Miller, C., & Hooper, S. (2008). Commodity, firmness, and delight: Four modes of instructional design practice. In L. Botturi & T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 1–17). Hershey/New York: Information Science Reference.

Iiyoshi, T., & Kumar, M. S. V. (2008). *Opening up education: The collective advancement of education through open technology, open content, and open knowledge*. Cambridge, MA: MIT Press.

Jackendoff, R. (1996). *The architecture of the language facility*. Cambridge, MA: MIT Press.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Cambridge, MA: MIT Press.

Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). Confronting the challenges of participatory culture: media education for the 21st Century (MacArthur commissioned report). Available online http://digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF. Accessed 11 Aug 2011.

JISC. (n.d). *Institutional approaches to curriculum design*. Curriculum Design programme Website. Available online at http://www.jisc.ac.uk/whatwedo/programmes/elearning/curriculumdesign.aspx. Accessed 11 Aug 2011.

Jones, C. (2007). Designing for practice: Practicing design in the social sciences. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning* (pp. 166–179). London: Routledge.

Kelly, A. E., Baek, J. Y., Lesh, R. A., & Banna-Ritland, B. (2008). Enabling innovations in education and systematizing their impact. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research methods in education: innovations in science, technology, engineering and mathematics learning and teaching* (pp. 3–18). New York/London: Routledge.

Koedinger, K. R., & Corbett, A. (2008). Technology bringing learning science to the classroom. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 61–77). Cambridge: Cambridge University Press.

Koper, R., & Manderveld, J. (2004). Educational modelling language: Modelling reusable, interoperable, rich and personalised units of learning. *British Journal of Educational Technology, 35*(5), 537–552.

Koper, R., & Olivier, B. (2004). Representing the learning design of units of learning. *Education, Technology and Society, 7*(3), 97–111.

Koper, R., & Tattersall, C. (2005). *Learning design: A handbook on modelling and delivering networked education and training*. Berlin/Heidelberg: Springer.

Laseau, P. (1986). *Graphic problem solving for architects and designers* (2nd ed.). New York: Van Nostrand Reinhold.

Lockyer, L., Bennett, S., Agostinho, S., & Harper, B. (2008). *Handbook of research on learning design and learning objects*. Hersey: IGI Global.

Massironi, M. (2002). *The psychology of graphic image: Seeing, drawing, communicating*. Mahwah: Lawrence Erlbaum Associate.

Masterman, L. (2008a). Activity theory and the design of pedagogic planning tools. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies* (Vol. 1, pp. 209–227). Hershey/New York: Information Science Reference.

Masterman, L. (2008b). *Phoebe pedagogy planner project: Evaluation report*. JISC E-Learning and Pedagogy Programme. Oxford: Oxford University.

Mayes, T., & De Freitas, S. (2004). *Review of e-learning frameworks, models and theories*. JISC e-learning models desk study. Available online at http://www.jisc.ac.uk/uploaded_documents/Stage%202%20learning%20Models%20(Version%201).pdf. Accessed 11 August 2011.

McKim, R. H. (1980). *Thinking visually: A strategy manual for problem solving*. Belmont: Lifetime Learning Publications.

Neal, L., & Miller, D. (2005). The basics of e-learning: Excerpt from the handbook of human factors in web design. *eLearn, 8*, 2.

Oliver, R. (1999). Exploring strategies for on-line teaching and learning. *Distance Education, 20*(2), 240–254.

Oliver, R. (2000, December 9–12).Where teaching meets learning: Design principles and strategies for Web-based learning environments that support knowledge construction. In *Proceedings of the ASCILITE Conference*, Coffs Harbour. Available online at http://www.ascilite.org.au/conferences/coffs00/papers/ron_oliver_keynote.pdf. Accessed 11 Aug 2011.

Oliver, R., & Herrington, J. (2001). *Teaching and learning online: A beginner's guide to e-learning and e-teaching in Higher Education*. Perth: Edith Cowan University.

Oliver, R., & Littlejohn, A. (2006). *Discovering and describing accessible and reusable practitioner-focused learning*. Paper presented at the Proceedings of Theme 1 of the JISC Online Conference: Innovating E-Learning, 2006.

Oliver, R., Harper, B., Hedberg, J., Wills, S., & Agostinho, S. (2002, July 7–10). *Formalising the description of learning designs*. HERDSA Conference, Perth, Australia. Available online at http://elrond.scam.ecu.edu.au/oliver/2002/herdsa.pdf. Accessed 11 Aug 2011.

Paquette, G. (2004). Instructional engineering for learning objects repositories networks. In *Proceedings of International Conference on Computer Aided Learning in Engineering Education (CALIE 04)*, Grenoble, France. Available online at http://www-clips.imag.fr/calie04/actes/Paquette.pdf. Accessed 11 Aug 2011.

Paquette, G., Léonard, M., & Lundgren-Cayrol, K. (2008). The MOT+ visual language for knowledge-based instructional design. In L. Botturi & T. Stubbs (Eds.), *Handbook of visual languages for instructional design. Theories and practices*. Hersey: IGI Global.

Reigeluth, C. M., & An, Y. J. (2009). Theory building. In C. M. Reigeluth & A. Carr-Chellman (Eds.), *Instructional-design theories and models, Vol. III: Building a common knowledge base*. New York: Routledge.

Reigeluth, C. M., & Carr-Chellman, A. A. (2009a). Understanding instructional theory. In C. M. Reigeluth & A. A. Carr-Chellman (Eds.), *Instructional-design theories and models* (Vol. III). London: Routledge.

Reigeluth, C. M., & Carr-Chellman, A. A. (2009b). *Instructional-design theories and models* (Vol. III). London: Routledge.

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in general theory of planning. *Policy Sciences, 4*(2), 155–166.

Rose, G. (2001). *Visual methodologies: An introduction to the interpretation of visual materials*. Thousand Oaks: SAGE.

Salomon, G. (Ed.). (1993). *Distributed cognitions – Psychological and educational considerations*. Cambridge: Cambridge University Press.

Sawyer, R. K. (2006). *The Cambridge handbook of the learning sciences*. Cambridge: Cambridge University Press.

Spector, M. J., Merrill, M. D., van Merrienboer, J., & Driscoll, M. P. (2008). *Handbook of research on educational communications and technology* (3rd ed.). New York: Routledge.

Stubbs, S. T., & Gibbons, A. S. (2008). The power of design drawing in the other design fields. In L. Botturi & T. Stubbs (Eds.), *Handbook of visual languages for instructional design. Theories and practices*. Hersey: IGI Global.

Vygotsky, L. S. (1978). *Mind in society, the development of higher psychological processes*. Oxford: Harvard University Press.

Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development, 53*(4), 5–23.

Wilson, P. (2007). *Progress report on capturing eLearning case studies* (Internal report). Milton Keynes: The Open University.

Winograd, T. (1996). *Bridging design to software*. New York: Addison Wiley.

Chapter 8
Design Representations

Introduction

This chapter will describe the range of ways in which learning interventions can be visualised and represented, along with a discussion of the benefits of each of these and how they can be used as part of both the design process and as a means of making the inherent design of a learning activity explicit. The chapter builds on a paper presented at the Networked Learning 2010 conference (Conole 2010).

Types of Representation

Learning designs can be 'represented' or 'codified' in various ways; each representation will articulate particular aspects of the learning that the designer anticipates will take place (Conole 2009). Each design representation foregrounds different aspects of the inherent 'master' design, as discussed in Chapter 5. These forms of representation range from rich contextually located examples of good practice (case studies, guidelines, etc.) to more abstract forms of representation that distil out the 'essence' of good practice (such as models or pedagogical patterns). This section describes what is meant by 'design representation'. It gives an overview of the different types of representations: the formats they can be presented in, the level of granularity of design they portray and an indication of the particular 'lens' each representation provides on the inherent 'master design'.

Conole and Mulholland (2007) outlined a number of common representations. These included essentially practice-focussed representations (e.g. case studies, lesson plans and patterns), conceptual representations (e.g. mind maps and metaphorical representations), more abstract representations (e.g. models and vocabulary) and

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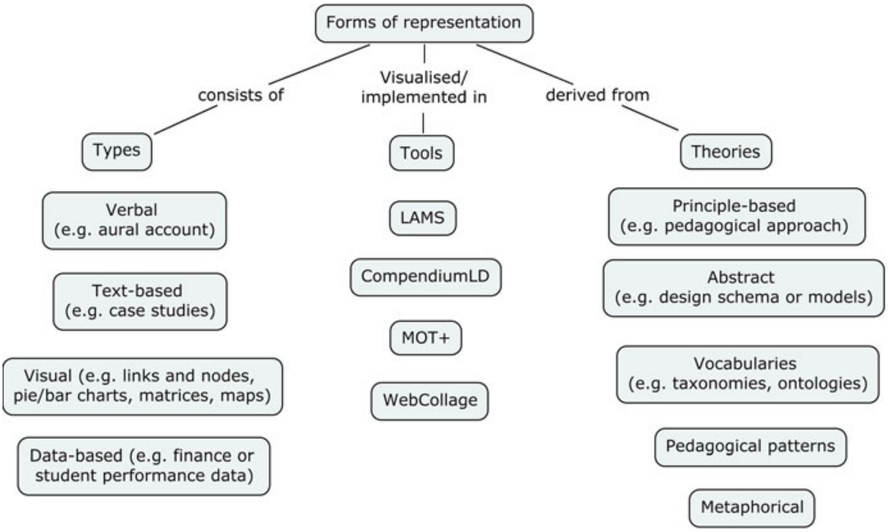


Fig. 8.1 Forms of representation

technically orientated representations (e.g. UML[1] diagrams). They argued that there are a number of uses of these different presentations. For example, enabling educational researchers to analyse and develop educational innovations, supporting teachers in planning learning interventions, facilitating software designers to instantiate lesson designs in software or supporting learners in understanding what they are doing and why. The type of representation is crucially dependent on its purpose.

This chapter builds on this work and describes different types of representations and how they can be used. Figure 8.1 provides a more generic description of the types of representation. Four main types of representations are identified: verbal, textual, visual or data based. A range of tools is now available to help visualise designs and, in some cases, actually implement designs. Four examples are shown. The Learning Activity Management System (LAMS)[2] uses a link and node visualisation, but because LAMS sequences are 'runnable', the basic components of the system are tool focussed (Dalziel 2003, 2007). CompendiumLD[3] is also link and node based, but can be used across a broader range of granularity of designs (Conole et al. 2008). CompendiumLD maps can be exported in a variety of formats but are not directly runnable. MOT+ is a graphical language and editor, which helps define activity sequences, actors and tools (Paquette 2004; Paquette et al. 2008). Finally, WebCollage visualises pedagogical patterns taking a metaphorically based approach to visualise designs around their description, such as

[1] Unified Modeling Language—see, for example, http://www.ibm.com/developerworks/rational/library/769.html

[2] http://lams.org

[3] http://compendiumld.open.ac.uk

'pyramid' or 'jigsaw' (Hernández-Leo et al. 2005, 2006). These visualisation tools are discussed in more detail in the next chapter.

Many representations are primarily practice orientated in nature. However, some have a particular theoretical basis, for example, designs which explicitly align with a particular pedagogical perspective such as constructivism or pedagogical patterns which have a prescribed format and are based on an underlying theoretical perspective based on the work of Alexander (see, e.g. Alexander 1977; Alexander et al. 1977; Goodyear 2005; Goodyear and Retalis 2010). Vocabularies (see, e.g. Conole 2008a) and abstract representations such as design schema and pedagogical models, such as Laurillard's conversational framework (Laurillard 2002), are also examples of representations that are based on theoretical perspectives. Whilst clearly this is not a perfect classification, it does give some indication of the breadth of types of representation that are possible.

Representations can have different formats and can be used to describe different aspects of the design life cycle and can provide different lenses on the inherent design, foregrounding specific aspects:

- Formats: These can include different types of text-based representations (e.g. case studies or narratives), visualisation representations (e.g. node-link types representations, design schema or metaphorical), numerically focussed (e.g. pie or bar charts based on underlying numerical data), representations based on other forms of media (e.g. audio or video) or representations can be a combination of the above.
- Levels: Designs can describe small-scale learning activities (which might describe a few hours worth of learning) or scale up to a description of a whole curriculum (across, e.g. a 3-year undergraduate degree course or a 1-year master's course).
- Lenses: The focus might be on the nature of the tasks being undertaken and associated tool and resources, on the overarching pedagogical principles, in terms of mapping different components of the design together or exploration of data on the course performance and student evaluations (such as financial or student performance data).

Conole and Mulholland (2007) further classified representations into three levels:

> At a simplistic level this has an educational component (the pedagogical intention and aspiration) and a technological component (what technologies will be used, how and their associated affordances). A meditational layer, which describes the process or operational dimension, provides the link between these.

They go on to suggest that the educational view provides the underlying pedagogical model (such as the learning outcomes and pedagogical approach). The process-based/operational view focuses on enactment of the design. Examples include representations that are essentially stage based (where the focus is on what is happening in a temporal sequence) or schema based (which outlines not only the sequential set of tasks but also the associated roles, resources, tools and outputs). The final technical view, they argue, provides the 'technical implementation blueprint' and the rule-based runtime of the data flow.

Examples of Different Types of Representation

This section describes a set of representations that we have developed as part of our learning design research. It will describe each representation, provide an illustrative example and suggest how each representation can be used. The representations presented here are not intended to be comprehensive but to give a flavour of the variety of representations and an indication of their uses. They cover the spectrum of different types of format, level and lenses described earlier (Table 8.1). They include textual summaries, content maps, a course view map, a pedagogy profile, a task swimlane view, a learning outcomes map, a course dimensions view and a principles/pedagogy matrix.

Textual

This is the most common way in which courses are represented. It can range from a brief textual overview plus descriptive keywords through to a more detailed breakdown of the curriculum covered and the associated learning, teaching and assessment strategy for the course. Such textual representations are common and form the basis of most course descriptions. Textual descriptions can also be used to indicate the pedagogical intent of the course or can be aligned to a particular theoretical basis, as is the case with pedagogical patterns, which follow a particular style and format. One of the drawbacks of textual descriptions of a course is that they tend to focus on the content and do not give enough of an indication of the nature of the learning activities that the students will do nor an overall picture of the learning experience.

Content Map

Another common way of representing designs is in terms of content (Fig. 8.2). Content can be organised in a number of ways, but a particularly helpful one is to

Table 8.1 Summary of the different types of representation

Representation	Format	Level	Lens
Textual summary	Text	Macro	Descriptive overview
Content map	Node-link	Meso, macro	Content hierarchy and structure
Course map	Boxes	Macro	Pedagogy overview
Task swimlane	Node-link	Micro	Tasks breakdown: roles, tasks, associated tools/resources
Pedagogy profile	Bar chart	Macro	Overview of learner tasks
Learning outcomes	Node-link	Macro	Mapping of outcomes to tasks and assessment
Course dimensions	Spider diagram	Macro	Details of the format of the course
Principles matrix	Matrix	Macro	A map of course principles to pedagogy overview

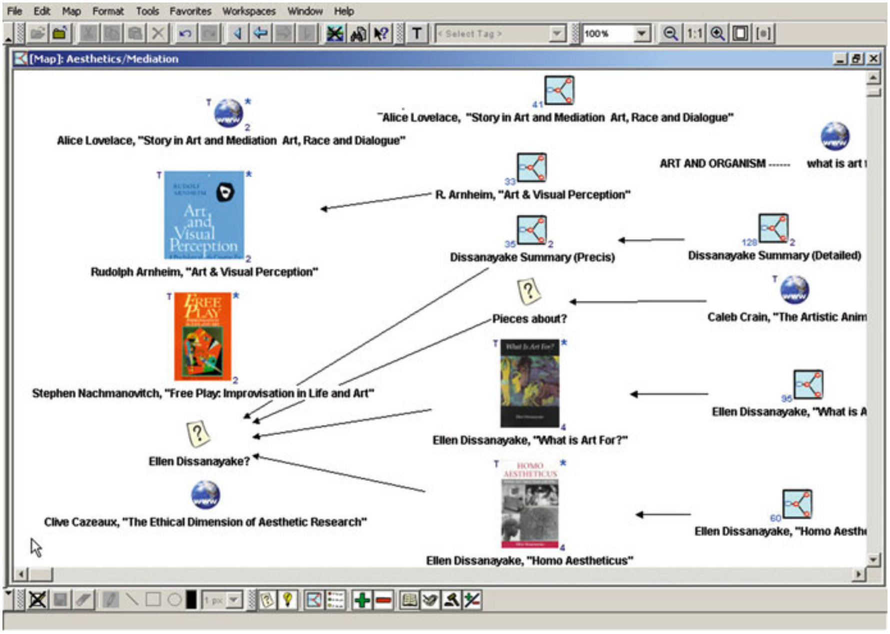


Fig. 8.2 Compendium map of the concepts on a course on literature analysis

organise it into a series of themes and sub-themes, although alternatives are possible that can be temporally based or metaphorically based. Buckingham Shum and Okada (2007, 2008) show how the Compendium software tool[4] can be used to represent content.

For example, Fig. 8.2[5] shows an example of a mapping of content related to the topic of literature analysis mapped in the Compendium tool. It shows not only the sub-topics but the relationships between them. Compendium can include a range of media, such as images, video and word documents.

Similarly, Fig. 8.3[6] is an example of a mapping of a course on strategy. In this instance, the map starts with a central topic/question, namely, what is meant by strategy, linked to a series of sub-themes addressing the question.

The textual and content mapping representations are probably the most common ways in which teachers think about their designs. However, taking a more activity-focussed approach about using different tools/resources requires other representations.

Sherborne (2008) argues that:

> Concept mapping could help curriculum developers and teachers at various stages of the [design] process. The ability of maps to focus on key ideas and their connections may help curriculum designers to survive better the translation into classroom experience and promote collaborative working methods.

[4] http://compendium.open.ac.uk/institute/

[5] http://compendium.open.ac.uk/institute/images/PhDDatabase.jpg

[6] http://projects.kmi.open.ac.uk/osc/compendium/ou_cmap/

Fig. 8.3 A concept map in Compendium on a course on strategy

The Course Map View

The course map view (Fig. 8.4) provides an overview of a course at a glance and enables teachers to think about the design of the course from four meta aspects, namely:

- Guidance and support: This is essentially the learning pathway and includes details on the course structure and timetable. It can include aspects such as the course calendar, any study guides, information on tutorials and other forms of support.
- Content and activities: This includes information on the course materials and activities, ways in which the course builds on the learners' prior experiences and inclusion of any learner-generated content. Examples of materials might include course texts and readings, DVDs and podcasts, whilst activities might include laboratory or fieldwork, work-based placements or student project work.
- Communication and collaboration: This is essentially the dialogic element of the course. It is the social dimension of the course and describes the ways in which learners are expected to interact with each other and their tutors. It might include the use of course forums, email or social networking tools.
- Reflection and demonstration: This is the assessment component of the course. It can include information on any diagnostic, formative and summative assessment. These might be achieved through multiple-choice quizzes, assignment or formal examinations. In addition, there might be specific instruction at key points for the students to reflect on their learning and understanding to date.

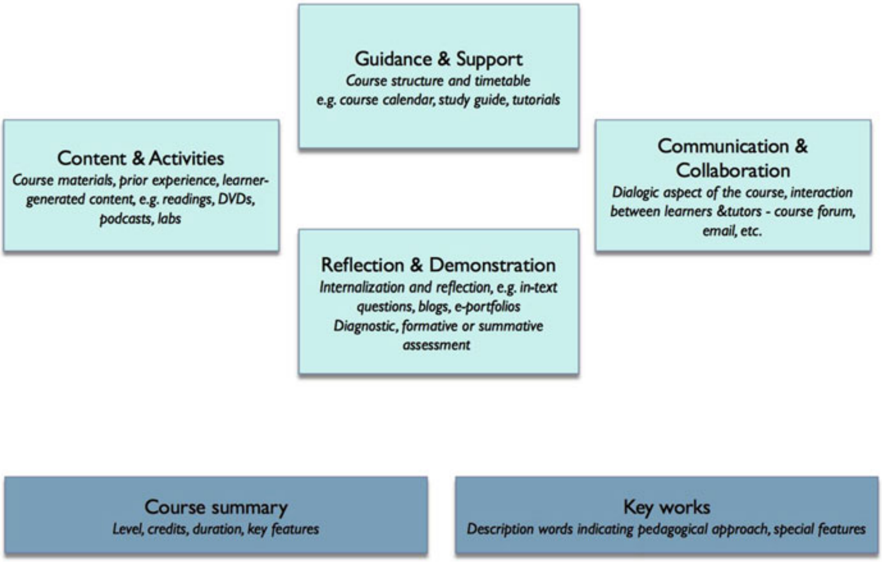


Fig. 8.4 The course map view

In addition to these, there are two boxes which provide a brief course summary and a list of keywords.

The course map representation gives an 'at a glance' overview of the course. The representation is based on articulation of the gross-level aspects of what the learner is doing and how they are learning (information/experience, communication/interaction and thinking/reflection), the guidance/support they receive and the way in which they are expected to evidence/demonstrate their learning. A 3D representation of the course map nicely illustrates the relationship between the different aspects of student learning and the overall guidance/support and the evidence/demonstration of their understanding (Fig. 8.5).

The representation enables the designer to describe the course in terms of the types of learning activities the learner is undertaking, as well as the guidance and support provided and the nature of any assessment.

The course map is derived from an underlying theoretical perspective developed by Conole et al. (2004). Figure 8.6 shows that the different facets of learning can be mapped to three dimensions, that is, the extent to which learning is achieved through: (1) information or experience, (2) individually or in a social context and (3) non-reflective or reflective learning. Guidance and support can be considered to sit within the centre of this representation. Contents and activities map to the information and experience dimension, communication and collaboration to the individual and social dimension, and reflection and demonstration to the non-reflective and reflective dimension. Interestingly, this 3D representation can also be used as a means of assessing how different tools are used in particular contexts and the extent to which these support the different facets of learning (see Conole 2008a for more on this).

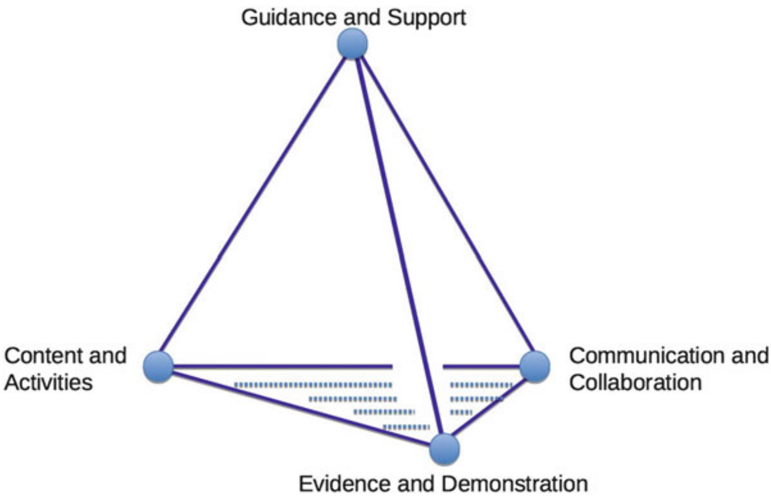


Fig. 8.5 A 3D representation of the course map view

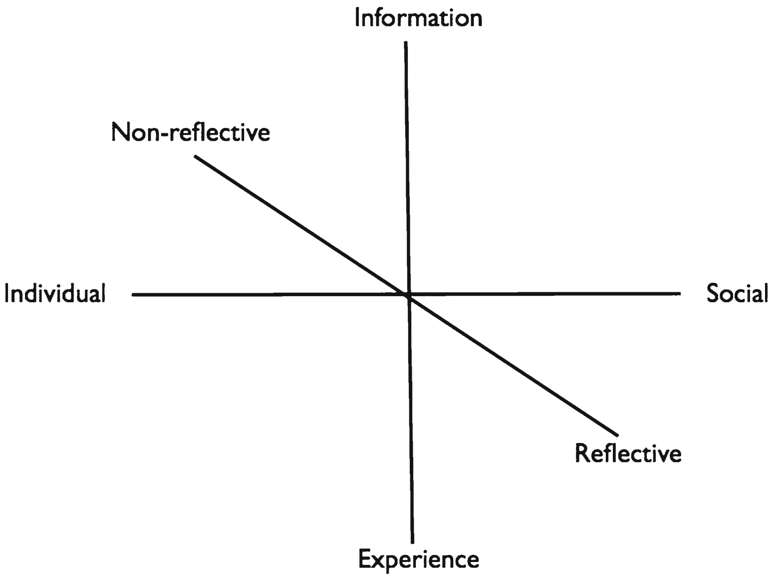


Fig. 8.6 The three dimensions of the facets of learning

The Pedagogy Profile

The pedagogy profile is a worked up version of the media advisor toolkit developed some years ago (Media Advisor n.d.; Conole and Oliver 1998), modernised against task types developed as part of a learning activity taxonomy (Conole 2008a). In essence, there are six types of tasks learners can do:

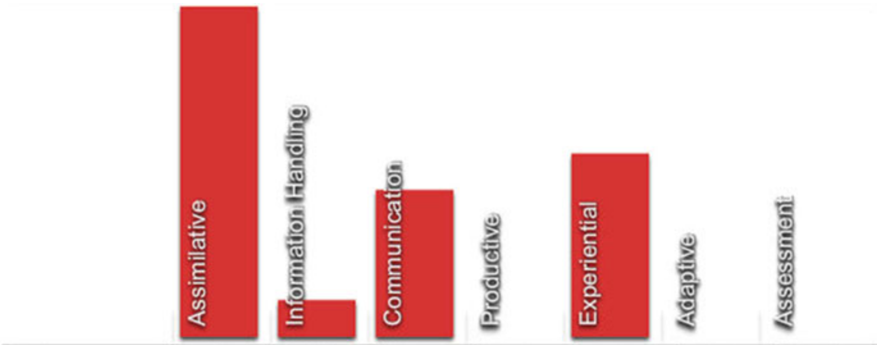
- Assimilative—reading, listening, viewing
- Information handling—manipulating data or text
- Communicative—discussing, critiquing, etc.
- Productive—producing an artefact such as an essay, architectural model, etc.
- Experiential—practising, mimicking, applying, etc.
- Adaptive—modelling or simulation

In addition, learners undertake some form of assessment activities. The user indicates the amount of each type of task and the amount of assessment to create a pedagogy profile for a course—indicating the proportion of each type of tasks. An interactive pedagogy widget is available in the Cloudworks site.[7] Figure 8.7 shows an example of the use of the pedagogy profile to map 4 weeks of a course. In this example, the students spend 18 h doing assimilative activities, 4 h of information handling, 8 h of communication in the course forum and 10 h of experiential activities in the form of a work-based placement. The advantage of this view is that it enables the designer to see the types and spread of learning tasks that the learners are engaged with. Often the assimilative and assessment activities are high, which may prompt the designer to rethink the nature of the tasks the learners are undertaking. In addition, this view is useful in that it can also be used by learners to profile the kinds of tasks they are engaged with. It would be interesting to compare the profile of a course from both the learner and teacher perspectives, to see how well they are aligned.

The Task Swimlane Representation

The task swimlane representation describes the level of a learning activity typically a few hours in duration. It is derived from an underlying learning activity taxonomy (Conole 2008b), which describes the components that need to be addressed when designing at this level (such as the tools and resources involved in the activity, the kinds of tasks the students will do, and the roles of those involved in the learning intervention). This representation enables the designer to think about the relationships between the different components and any associated interdependencies.

[7] http://cloudworks.ac.uk/index.php/cloud/view/2459



Item	Assim.	Info H.	Comm.	Prod.	Exper.	Adapt.	Assess.
Week 1	10	0	2	0	0	0	0
Week 2	4	0	2	0	0	0	0
Week 3	4	2	2	0	0	0	0
Week 4	0	0	2	0	10	0	0
TOTALS	18	2	8	0	10	0	0

Fig. 8.7 The pedagogy profile

Figure 8.8 illustrates an example of the task swimlane view. It shows a simple learning activity, which consists of the learner reading some instructions, working through a set of content, doing a quiz to test their understanding and then having a feedback session with an advisor. The associated resources and tools for each task are linked to the relevant task node with arrows. This example was created using the CompendiumLD tool, which is discussed in Chapter 9.

This is an example of what McKim (1980) categorises as a link-node diagram, where concepts/entities are represented as nodes and where the connections between the nodes have meaning. In our work so far, nodes and links have been given equal weight, but it is also possible to use size or boldness as a means of conveying relative importance. The core learning design icon set in the tool is derived from an underlying learning activity taxonomy (Conole 2008b). The tool also includes embedded help features and can be exported in a number of formats (see Conole et al. 2008 for more on CompendiumLD). Task swimlanes can also be used to describe activities based on specific design types. For example, the 'think-pair-share' pedagogical pattern represented by Hernández et al. (2005) as a metaphorical visualisation can also be represented as a task swimlane.[8]

[8] http://cloudworks.ac.uk/cloud/view/1800

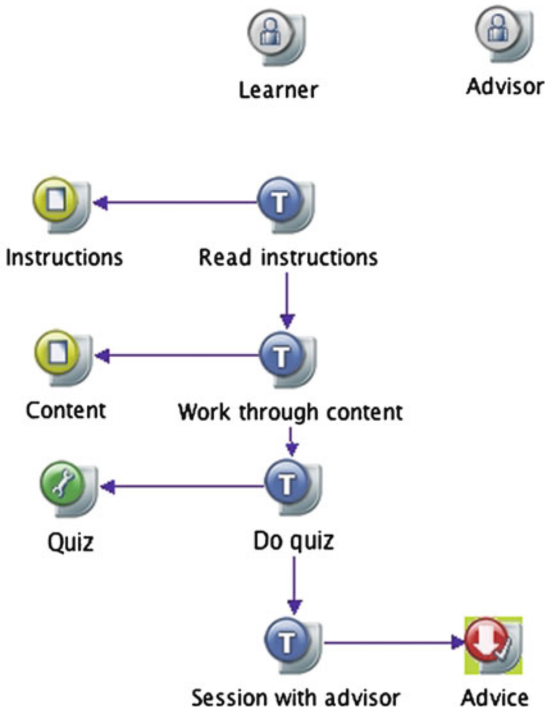


Fig. 8.8 The task swimlane view

Learning Outcomes Map

In addition to mapping at the level of individual activities, it is also important to be able to map at the meso- and macro-level in terms of mapping different components of the course, such as learning outcomes, content, activities and assessment. Standard mind mapping and concept mapping tools can be really helpful in laying out and making these kinds of connections explicit. A number of different configurations and layouts can be envisaged. The learning outcomes view enables the teacher to judge to what extent there is constructive alignment (Biggs 1999) with the course; that is, it looks at how the learning outcomes map to the student activities and to the assessment tasks. There are two aspects of constructive alignment. Firstly, learners construct meaning from what they do to learn. Secondly, the teacher aligns the planned learning activities with the learning outcomes. The learning intervention is designed so that the learning activities and assessment tasks are aligned with the intended learning outcomes.

The value of this view is that it enables the designer to check if all the intended learning outcomes are mapped to tasks and assessment activities. For example, Fig. 8.9 shows a simple learning activity where one of the learning outcomes, concerned with collaboration, is not mapped to any tasks or assessment activities.

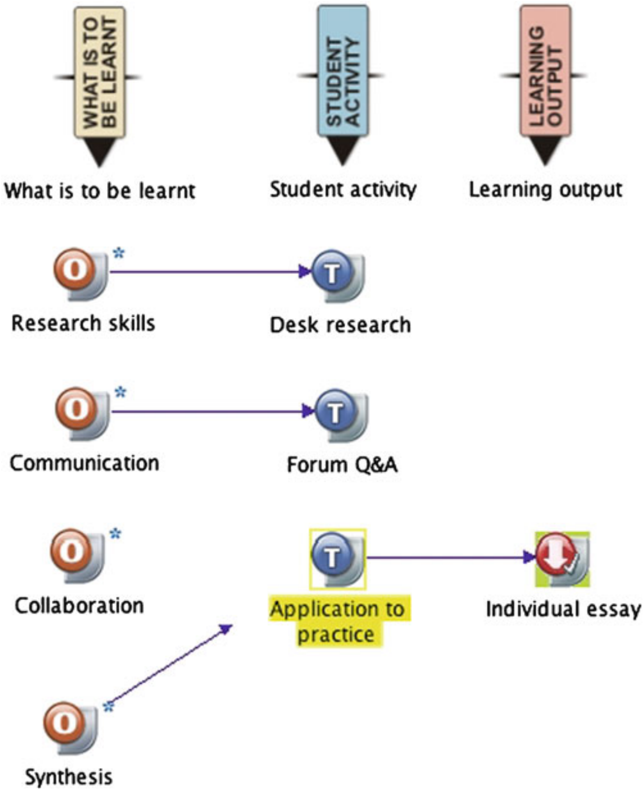


Fig. 8.9 The learning outcomes map in CompendiumLD

The designer can then decide whether to include some activities to ensure this learning outcome is met or remove this as a learning outcome.

The Course Dimensions View

The course dimensions view gives a more detailed indication of the nature of the course and how it is supported. It consists of four quadrants related to the four aspects of the course map view, namely, guidance and support, content and activities, communication and collaboration, and reflection and demonstration. In the example shown (Fig. 8.10), there is a high degree of tutor guidance and peer support. In terms of content and activities, the course is rich in terms of the amount of interactivity and the use of multimedia. However, there is little in the way of communication and collaboration. The course has a high degree of both formative and summative assessments. The resultant spider diagram provides a nice way of giving an illustrative view of what the course is like.

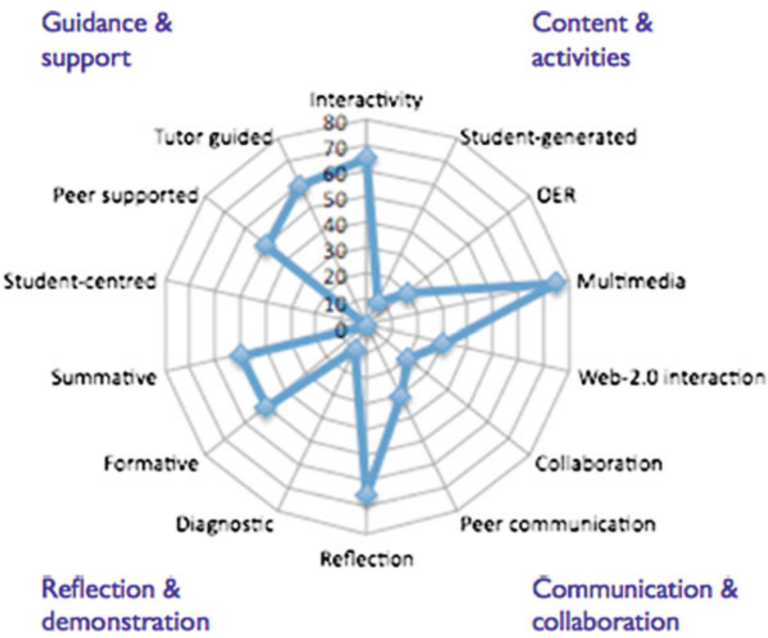


Fig. 8.10 The course dimensions spider view

The Principles/Pedagogy Matrix

This representation articulates the pedagogical approach being adopted by the course and the overarching principles (see Conole 2008a for more details). It provides a matrix that maps the principles of the course against four macro-level aspects of pedagogy (Fig. 8.11). Principles might be generated/articulated by the course team (e.g. getting the students to reflect on experience and show understanding or incorporating frequent interactive exercises and feedback across the course) or might be derived from theory or empirical evidence.

Variants on the matrix are also possible, for example, mapping principles to course activities or mapping the principles to a different set of pedagogical characteristics (e.g. Bloom's educational taxonomy, the REAP principles [Nicols 2009] or Laurillard's conversational framework [Laurillard 2002]).

Evaluation of the Views

The representations presented here have been trialled in a number of venues and appear to provide robust and useful representations. These visualisations are enabling practitioners to be more creative in their design practice, thinking beyond

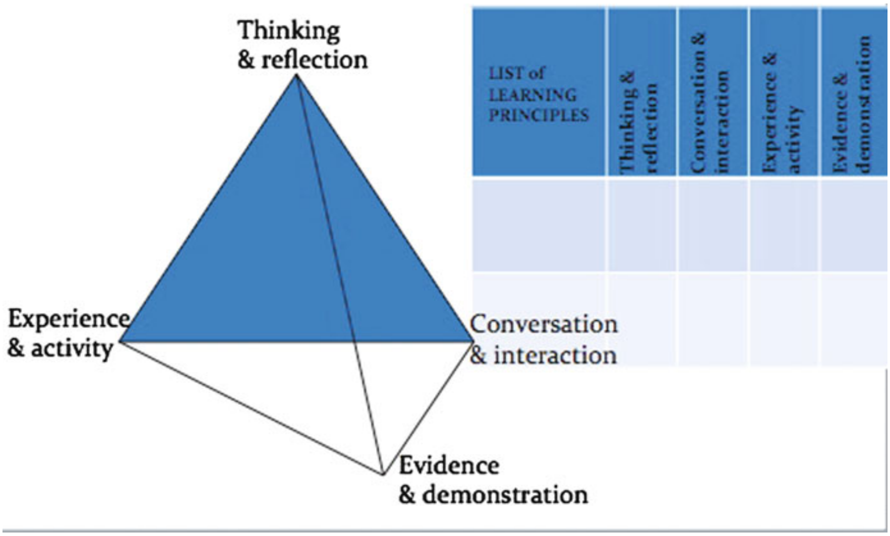


Fig. 8.11 The principles/pedagogy matrix

subject content to a focus on what the learners will be doing. The task swimlane representation, for example, has been used extensively and is built into our visualisation tool CompendiumLD (Conole et al. 2008). The pedagogy planner and the course map representations were used at a Blended Design Challenge workshop, to help guide teams to design.[9] A 3D 'task-in-context to pedagogy' map has been produced, based on earlier work (see Conole et al. 2004; Conole 2008a).We have also being exploring data-derived representations such as views based on financial data for a course or student performance data.[10] We have also evaluated a series of workshops exploring the use of these design representations with pedagogical patterns work (Dimitriadis et al. 2009; Conole et al. 2010).

The Emotional Regulation Learning Intervention

The previous section described the general nature of the views; this section describes these applied to a particular learning intervention. The learning intervention was designed as part of the X-Delia project,[11] which is exploring the use of gaming and sensor technologies with traders and investors. The focus of the learning intervention is on developing emotional regulation in financial investors. The learning

[9] http://cloudworks.ac.uk/cloud/view/2640

[10] See http://cloudworks.ac.uk/index.php/cloudscape/view/1907 for more details.

[11] http://www.xdelia.org/

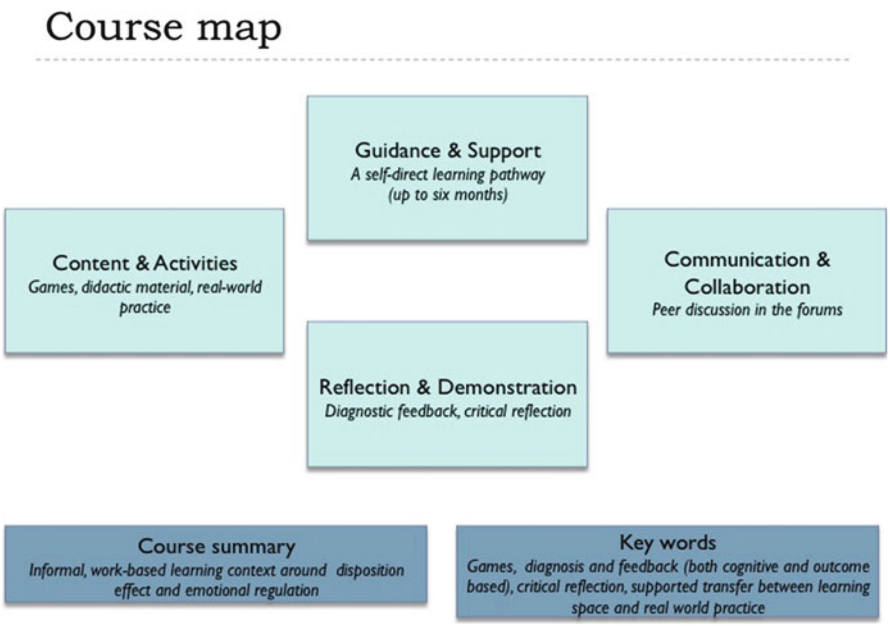


Fig. 8.12 The X-Delia learning intervention course map

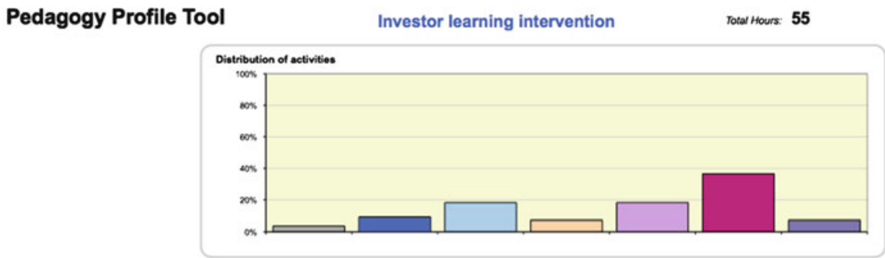
intervention consists of a series of interactive games. In terms of timescales, the learning pathway is intended to extend over 6 months, different individuals will do different aspects; therefore, the following are intended as an indicative average amount of time on different aspects of the learning intervention; in reality, different learners will spend a different amount of time working on this.

Figure 8.12 shows the course view map. The guidance and support consists of a self-directed learning pathway (up to 6 months). Content and activities are made up of a series of games, relevant didactic material and some real-world practice. There are no collaborative activities, but learners are able to communicate with peers in a discussion forum. There are no formal assessment activities, but the reflection and demonstration consists of diagnostic feedback and critical reflection.

Pedagogy Profile

The pedagogy profile is shown in Fig. 8.13, and the learner activities break down as follows:

- Assimilative: didactic content (10 min–1 h, depending on choices made by the individuals)
- Information handing: the index game (for each iteration 30 min–1 h) and aiming game (for each iteration 30 min–1 h)



	Assimilative	Info. Handling	Adaptive	Communicative	Productive	Experimental	Assessment
Percentage	4%	9%	18%	7%	18%	36%	7%
Total hours	2	5	10	4	10	20	4
Diagnostic activity	2						4
Disposition effect games		1	5			5	
Emotion regulation games			5			5	
Deliberative trading practice						10	
Structured diary and template work					4		
Critical reflection		4			6		
Asynchonous peer disc				4			

Fig. 8.13 The X-Delia learning intervention pedagogy profile

- Communication: peer discussion (zero to several times a week 1 h)
- Productive: none
- Experiential: trading practice (1 h per week to review the feedback)
- Adaptive: none
- Assessment: diagnostic feedback (1 h), critical reflection (10 min at the end of every trading session)

Course Dimensions

The course dimensions view for the intervention is shown in Fig. 8.14. It indicates that the learning intervention is very activity based, with little in the way of tutor support. Reflection and demonstration of learning is mainly through self-reflection.

Learning Outcomes

There are four learning outcomes associated with the intervention:

- Understand the disposition effect[12] and emotional regulation
- Improved awareness of own profile in relation to the disposition effect and emotional regulation
- Develop skills in relation to the disposition effect and emotional regulation in a learning environment
- Support a transfer of skills into practice Figure 8.15 shows how these map to the various learning activities, all four are covered and indeed in all instances the learning outcomes map to two or more of the tasks.

[12] http://en.wikipedia.org/wiki/Disposition_effect

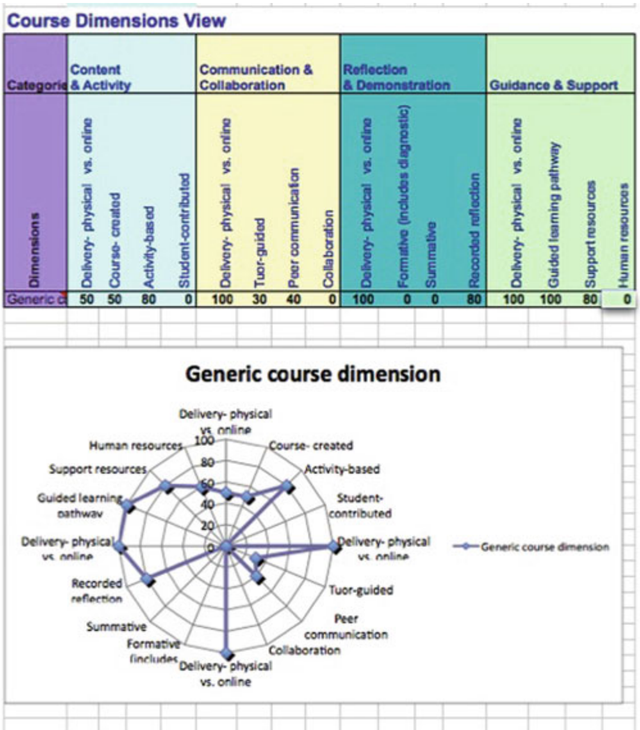


Fig. 8.14 The X-Delia learning intervention course dimensions view

Task Swimlane

The following learning activities make up the learning intervention (Fig. 8.16):

- Diagnostic feedback through an e-assessment tool, a questionnaire and calculations based on their existing trading history if they have one, and the two-index game.
- Some propositional knowledge through a series of videos, whereby different video segments are delivered based on the learners' response to the survey and calculations. Feedback becomes a vehicle for individualised didactic delivery of content.
- Engaging with two games iteratively: (1) the two-index game (disposition effect) in which the learner gets feedback each time on the extent to which they are displaying a dispositional effect and (2) access to a play environment where they can manage their emotional arousal in the aiming game. Each game has a number of levels of difficulty.
- Learning interventions about developing mindfulness, which is delivered online—this includes a tool on paced breathing meditation.

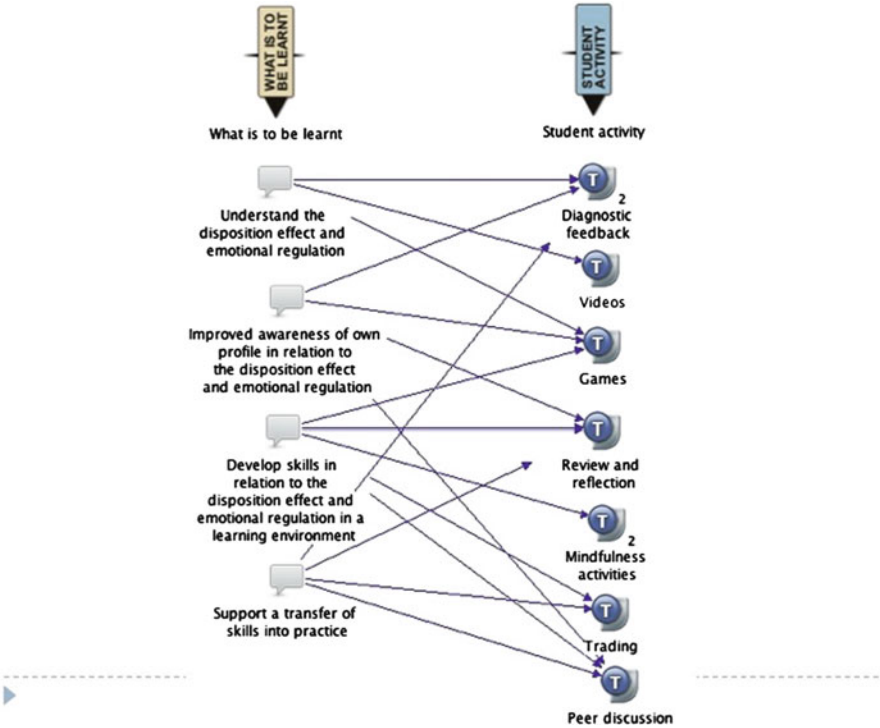


Fig. 8.15 The X-Delia learning intervention learning outcomes map

- Using sensors to review their emotional status in a trading context in a day trading centre (optional).
- Access to a peer discussion space so that the learners can come together in peer learning groups in discussion forums.
- Writing down and reviewing real-world trading practices and engaging in critical reflection. This includes recording and reviewing emotional state (e.g. rating themselves on the extent to which they have experience particular emotional states). Also make notes on what causes the emotions and what impact they think that has had on how they behave.

Conclusion

Representing design in a range of formats, beyond simple text, can help practitioners to think more creatively about their designs and can lead to new insights and understandings about the design process. There are parallels with Vygotsky's (1962,

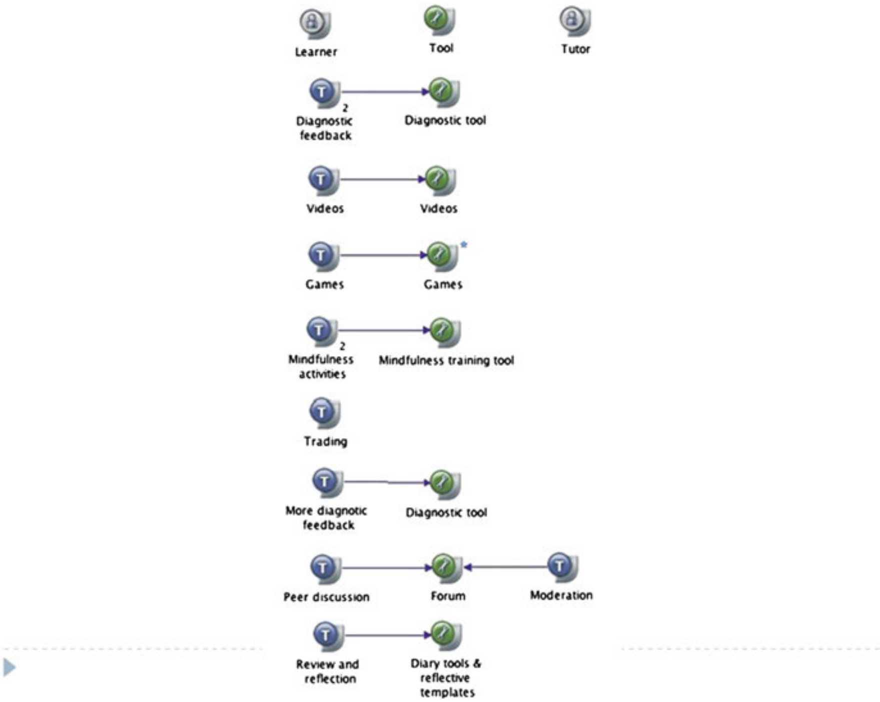


Fig. 8.16 The X-Delia learning intervention task swimlane view

1978) notions of language as a mediating artefact, 'thought is not merely expressed in [drawings], it comes into existence through them' (quoted in Stubbs and Gibbons 2008, p. 37). This chapter has attempted to categorise and outline a number of representations and their purposes. The selection chosen attempts to cover the full spectrum of designs: from learning activities to whole curriculum designs. But as Stubbs and Gibbons (2008, p. 46) point out, 'As important as drawing may be to the design process, it rarely stands alone. Design drawings are nearly always accompanied by narrative, which supplements and adds meaning'. They quote Bruner (2003):

> 'We organise our experiences and our memory of human happenings mainly in the form of narrative – stories, excuses, myths, reasons for doing and not doing and so on.'
>
> Whereas visual representations, on the other hand, 'can render phenomena, relationships and ideas visible, allowing patterns to emerge from apparent disorder to become detectable and available to our senses and intellect.'

This chapter has described some of the work we have been doing in terms of describing designs. It is evident that there is currently a lot of interest in this area and that we are moving towards a clearer understanding of different types of representations and how they can be used.

References

Alexander, C. (1977). *Pattern languages*. New York: Oxford University Press.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction* (Vol. 2). New York: Oxford University Press.

Biggs, J. (1999). *Teaching for quality learning at university*. Buckingham: Society for Research in Higher Education, Open University Press.

Bruner, J. (2003). The narrative construction of reality. In M. Mateas & P. Sengers (Eds.), *Narrative intelligence* (pp. vii, 340). Amsterdam: John Benjamins Publishing.

Buckingham Shum, S., & Okada, A. (2007). *Knowledge mapping for open sensemaking communities, researching open content in education – OpenLearn 2007*. Milton Keynes: The Open University.

Buckingham Shum, S., & Okada, A. (2008). Knowledge cartography for controversies: The Iraq debate. In A. Okada, S. Buckingham Shum, & T. Sherborne (Eds.), *Knowledge cartography – Software tools and mapping techniques*. London: Springer.

Conole, G. (2008a, July). New schemas for mapping pedagogies and technologies. *Ariadne Article*. http://www.ariadne.ac.uk/. Accessed 21 Sept 2011.

Conole, G. (2008b). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hersey: IGI Global.

Conole, G. (2009). Capturing and representing practice. In A. Tait, M. Vidal, U. Bernath, & A. Szucs (Eds.), *Distance and E-learning in transition: Learning innovation, technology and social challenges*. London: Wiley.

Conole, G. (2010). An overview of design representations, paper in a symposium – Conole, G., & Retalis, S. (2010, May 3–4). Symposium organisers – Current challenges in learning design and pedagogical patterns research, Networked Learning Conference, Aalborg, Denmark.

Conole, G., & Mulholland, P. (2007). *Using the concepts of design and narrative, The Personal Inquiry (PI) project* (Working paper two). Milton Keynes: The Open University.

Conole, G., & Oliver, M. (1998). A pedagogical framework for embedding CandIT into the curriculum. *ALT-J, 6*(2), 4–16.

Conole, G., Dyke, M., Oliver, M., & Seale, J. (2004). Mapping pedagogy and tools for effective learning design. *Computers in Education, 43*(1–2), 17–33.

Conole, G., Brasher, A., Cross, S., Weller, M., Clark, P., & White, J. (2008). Visualising learning design to foster and support good practice and creativity. *Educational Media International, 54*(3), 177–194.

Conole, G., McAndrew, P., & Dimitriadis, Y. (2010). The role of CSCL pedagogical patterns as mediating artefacts for repurposing Open Educational Resources. In F. Pozzi & D. Persico (Eds.), *Techniques for fostering collaboration in online learning communities: Theoretical and practical perspectives*. Hershey: IGI Global.

Dalziel, J. (2003, December 7–10). *Implementing learning design: The Learning Activity Management System (LAMS).* Paper presented at the ASCILITE 2003, Adelaide.

Dalziel, J. (2007). Building communities of designers. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning* (pp. 193–206). London: Routledge.

Dimitriadis, Y., McAndrew, P., Conole, G., & Makriyannis, E. (2009, December 6–9). *New design approaches to repurposing Open Educational Resources for collaborative learning using mediating artefacts*. ASCILITE Conference, Auckland.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology, 21*(1), 82–101.

Goodyear, P., & Retails, S. (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers.

Hernández, D., Asensio, J. I., & Dimitriadis, Y. A. (2005). Computational representation of collaborative learning flow patterns using IMS learning design. *Educational Technology and Society, 8*, 75–89.

Hernández-Leo, D., Villasclaras-Fernández, E. D., Ascensio-Pérez, J., Dimitriadis, I., Jorrín-Abellán, I. M., Ruiz-Requies, I., & Rubia-Avi, B. (2006). COLLAGE: A collaborative learning design editor based on patterns. *Educational Technology and Society, 9*(1), 58–71.

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.). London: RoutledgeFalmer.

McKim, R. H. (1980). *Thinking visually: A strategy manual for problem solving*. Belmont: Lifetime learning publications.

Media Advisor. (n.d.). Media Advisor available to download from http://www.londonmet.ac.uk/ltri/demos/media_adviser_files/media_adviser.htm. Accessed 11 Aug 2011.

Nicol, D. (2009). Assessment for learner self-regulation: Enhancing achievement in the first year using learning technologies. *Assessment and Evaluation in Higher Education, 34*(3).

Paquette, G. (2004). Instructional engineering for learning objects repositories networks. In *Proceedings of International Conference on Computer Aided Learning in Engineering Education (CALIE 04)*, Grenoble, France. Accessed online on 5 May 2005 at: http://www-clips.imag.fr/calie04/actes/Paquette.pdf. Accessed 11 Aug 2011.

Paquette, G., Léonard, M., & Lundgren-Cayrol, K. (2008). The MOT+ visual language for knowledge-based instructional design. In L. Botturi & S. T. Stubbs (Eds.), *Handbook of visual languages for instruction design: Theories and practices* (pp. 133–154). Hershey: Information Science Reference.

Sherborne, T. (2008). Mapping the curriculum: How concept maps can improve the effectiveness of course development. In A. Okada, S. Buckingham Shum, & T. Sherborne (Eds.), *Knowledge cartography – Software tools and mapping techniques*. London: Springer.

Stubbs, S. T., & Gibbons, A. S. (2008). The power of design drawing in the other design fields. In L. Botturi & T. Stubbs (Eds.), *Handbook of visual languages for instructional design. Theories and practices*. Hersey: IGI Global.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: MIT Press.

Chapter 9
Tools for Visualising Designs

Introduction

This chapter describes a number of tools that can be used for creating and visualising designs. These include specialised learning design tools, as well as the use of generic mind mapping tools. The learning design specific tools include the CompendiumLD tool developed as part of the OU Learning Design Initiative (OULDI) work, the learning activity management system (LAMS) visualisation sequencing tool, the WebCollage tool for representing pedagogical patterns and CADMOS (CoursewAre Development Methodology for Open instructional System). As an illustrative example of how mind mapping tools can be used, the tool Cmap will be discussed, along with the ways in which the kinds of representations described in the previous chapter can be instantiated using spreadsheets. The chapter will conclude with a discussion of the benefits of such tools, along with the challenges they present.

Katsamani and Retalis (2011) cite Lejeune et al. (2009), who suggest that the following criteria should be used when deciding which design tool to use: comprehensibility/usability, pedagogical neutrality, flexibility and interoperability. Karsamani and Retalis (2010) identified the following components associated with a teacher using a learning design tool:

> A teacher, with the aid of a learning design tool is called to orchestrate the learning activities that s/he thinks the students should perform in order to accomplish the desired learning objectives following the principles of a learning strategy. S/he might also need to specify the learning objects, tools and services that will be related to these activities. The teacher should also be able to determine in which order the students should perform the activities and any conditions, preconditions or rules that might exist. Additionally there must be flexibility when creating the leaning design. A teacher should be able to revise the design and add activities if s/he thinks that so far hasn't been fulfilled the scope of the course or remove an activity if s/he thinks that eventually it doesn't provide something to the learning process or change the rules or the execution order of the activities.

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_9,

As the last chapter described, representations are useful in a number of respects. Firstly, visualising the design helps make it more explicit, and hence, it can be shared and discussed with others. Secondly, the different types of visualisation described in the last chapter help guide the design process. Thirdly, the designs can be taken up and repurposed by others. This chapter will describe a number of design tools that can be used to create designs; these range from formal design tools that are runnable through to more 'fuzzy' tools.

CompendiumLD

A Description of the Tool and Its Functionality

In terms of guiding and representing learning designs, we have adapted an argumentation and visualisation tool (Compendium) to create a visualising tool for design, CompendiumLD.[1] CompendiumLD has been developed from our interpretation of the empirical data summarised in the previous chapter and a realisation that visualisation is underutilised as an approach to adopting a creative approach to the design process. Brasher et al. (2008) and Conole et al. (2008) provide more detailed information on the tool and associated technical developments; only the salient features are described here. Also see Cross (2010) which provides details of the technical development of the tool, the functionality and a summary of the evaluation of its use.

We wanted to use a flexible tool as the basis for our initial prototype. We considered various drawing packages, as well as more specialised mind mapping tools (such as Inspiration[2] and MindManager[3]). In the end, we choose to use Compendium,[4] a visual representation tool, originally developed for enabling group argumentation, which was produced by researchers at the Open University, UK. Compendium was originally developed to support concept mapping and argumentation ideas and can be used by individuals or in a group context to represent shared and developing understanding.

Figure 9.1 shows a screenshot of Compendium. A set of icons are shown on the left-hand side, and these can be dragged and dropped into the main working space on the right.

We selected Compendium for a number of reasons. Firstly, because it was produced at the Open University, we felt there was more opportunity for further tool development, specifically in terms of learning design requirements. Secondly, Compendium supports the creation of a range of visual mapping techniques, including mind maps, concept maps, Web maps and argumentation maps (Okada et al. 2008),

[1] http://compendiumld.open.ac.uk

[2] http://www.inspiration.com/

[3] http://www.mindjet.com/

[4] http://compendium.open.ac.uk/institute/

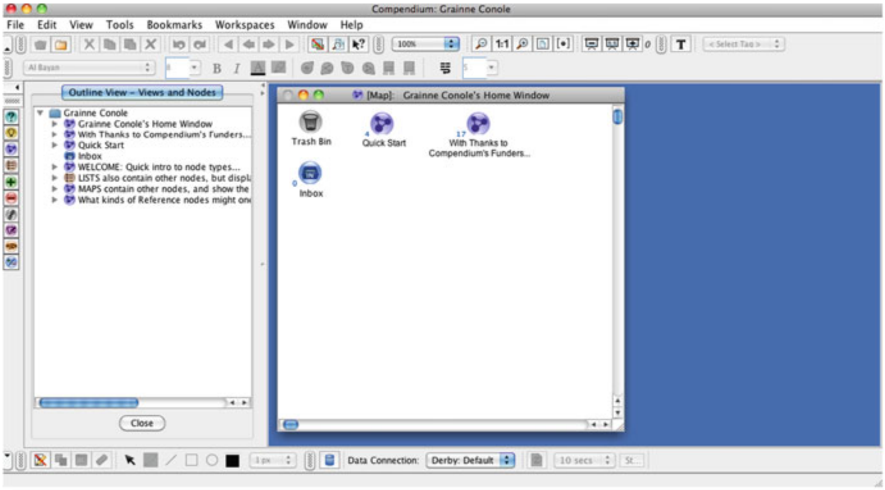


Fig. 9.1 Screenshot of Compendium

which we felt offered the potential for a range of flexible approaches to the design process. Compendium comes with a predefined set of icons (question, answer, map, list, pros, cons, reference, notes, decision and argument). The creation of a map is simple; users drag icons across and drop them onto the main window, thus creating a node. Relationships between the nodes are built up by dragging between nodes, thus creating a connecting arrow. Each node can have an associated name attached and displayed; if a more detailed textual description is associated with the node, an asterisk appears next to the node. If the user hovers their mouse over this, the content inside the node is revealed. Other types of electronic files can also be easily incorporated into the map such as images, videos, Word files or PowerPoint presentations. The reference node enables you to link directly to external websites. Icons can also be meta-tagged using either a predefined set of keywords or through user-generated terms. Maps can be exported in a variety of ways from simple diagrammatic jpeg files through to interlinked websites.

Compendium provides a utility by which users can create and share new sets of icons, for use as nodes. These sets, known as ‘stencils’, contain ‘items’, where an item defines certain properties of a potential node such as its image icon and label. In the standard version of Compendium, each item inherits the behaviour of one of the standard node types. The nodes each have an icon associated with them, a textual label can be added, along with other descriptive information. Nodes can be linked together with different types of arrows to indicate some form of connection. There are several different mechanisms by which a user can interact with nodes. These include drag and drop (e.g. to instantiate a node as described in the preceding paragraph), double-clicking (e.g. to display and edit details of a node including its text), right clicking (e.g. to display a menu offering actions and operations to apply to the node) and left clicking (e.g. to select a node or allow other menu-driven operations to be executed on the node).

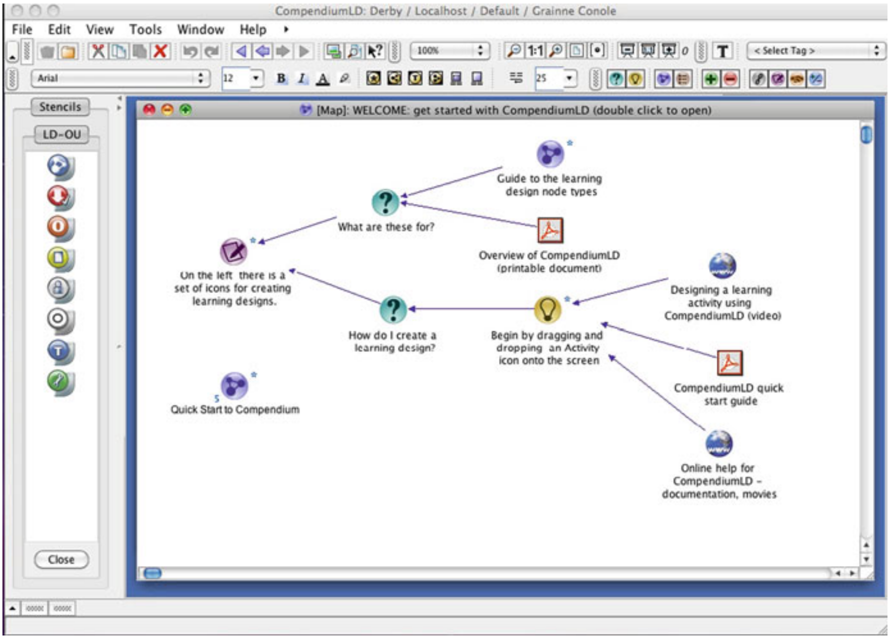


Fig. 9.2 A screenshot of CompendiumLD

It is available to download to PC, Mac and Linux platforms. We adapted Compendium to make it more explicit in terms of its use for learning design, and this version of the tool is referred to as CompendiumLD—it includes additional functionality such as tailored LD stencil sets and in situ help. In CompendiumLD, behaviour specific to learning design has been implemented for these modes of interaction as explained in the next few paragraphs. Figure 9.2 is a screenshot of CompendiumLD, showing the LD-OU stencil towards the left-hand side, and a map describing each item in the main window.

In addition to the standard icon set available in Compendium, we have created a set of stencils specifically for learning design:

- LD-OU: This consists of the core design icons, which include tasks, resources, tools, roles, outputs, assignments and an overarching map icon.
- Sequence mapping: A stencil to help with laying out the learning activity.
- Approaches to learning design: These consist of a set of predefined design sequences. For example, a template for the task swimlane representation described in the previous chapter.
- LD-Conditional stencil: These enable the user to include conditions in the design pathway.

CompendiumLD enables users to visually represent learning activities in a flexible way. They can map connections between tutors and learners, tasks, resources and tools, and a variety of notes and links to external websites or documents.

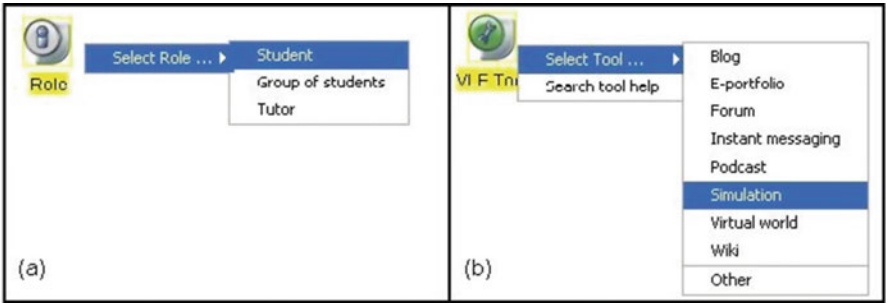


Fig. 9.3 Prompts presented for role and tool nodes

The process of mapping a learning activity in this way involves the user in a cognitive process of externalising their learning design plan. This facilitates and drives development of their own understanding of the nature of the activity, and the map facilitates communication of this understanding with others. We contend that this process of externalisation of the design, mapped using CompendiumLD, helps the designer to think more critically about the creation of a learning activity and what is involved, which is likely to lead to a better designed and more effective learning intervention.

In addition to providing a visual representation of the design process, we also wanted the tool to provide some form of inbuilt scaffolding and support to guide decisions at various points in the process. This we have achieved in a number of ways: by providing suggestions for each of the different types of nodes, additional resources and examples, and access to a restricted searchable set of additional help features. As an example of the first kind, when a user drags and drops a 'role' node onto the main design area, they are presented with a menu to select the type of role as shown in Fig. 9.3a. Therefore, this simple prompt reminds them of typical kinds of roles which they might want to include in their design sequence. The users are not restricted to these roles, however, and can choose to type in an alternative role of their specification. This sensitive balance between guided scaffolding and user flexibility/creativity is an important design principle for our development of CompendiumLD. A similar form of scaffolding is available for the 'tool' mode. When a user drags and drops a tool node onto the main design area, they will be presented with a menu to select the type of tool as shown in Fig. 9.3b (i.e. tools that are typically included in institutional learning management systems (LMS), such as a forum, blog or wiki). Note that the options for tools include 'other', which enables users to specify a tool of their own choosing. The 'other' icon allows the designer to specify a tool for face-to-face interactions, or a tool not currently supported by the LMS. The tool type selected is stored in CompendiumLD's data model, and tools to query the contents of this data model could be used to examine tool usage.

In terms of providing additional help, users of the system have the option of letting CompendiumLD offer context-sensitive help. For example, as the designer types into a task description label, the words typed are scanned and help related to selected verbs (e.g. collaborate, consider, discuss and reflect) pops up. An example

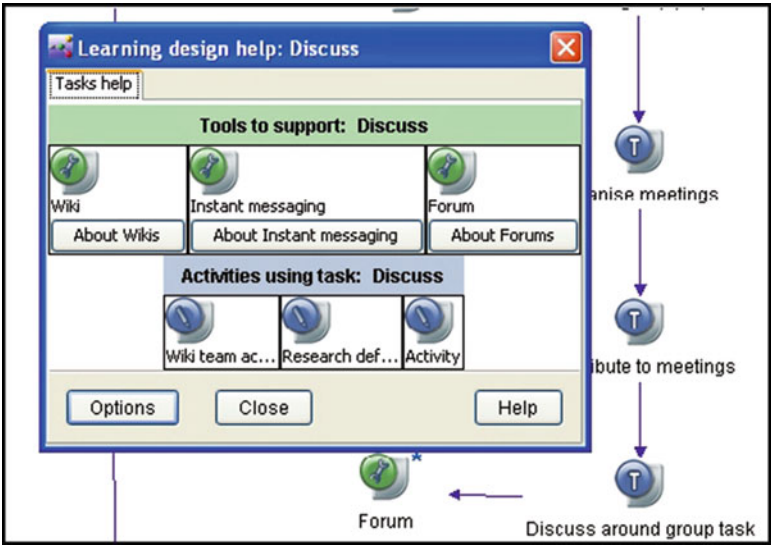


Fig. 9.4 Help relevant to a particular activity

of such a help window is shown in Fig. 9.4. In this example, the designer has typed 'discuss' into the task label: this prompts the application to pop up a window showing tools that might be appropriate in supporting discussion-based activities, as well as any existing activities that include tasks which contain the word 'discuss'. The set of tools shown in this help window are selected using a verb-to-tool lookup table based on verbs within a task taxonomy similar to that described by Conole et al. (2006) and Falconer and Conole (2006). The set of activities is generated by searching the database maintained by CompendiumLD for activities including tasks with 'discuss' in their label.

Further help is provided by the 'about' buttons. These buttons initiate a customised Google search of selected websites.[5] The websites were chosen because of the quantity and quality of the information they provide about use of tools in learning.[6] We adopted this pragmatic approach for a number of reasons. To create our own hand-crafted text would not only be time consuming but would suffer from quickly becoming dated. However, the alternative of a free Google search returns a daunting and untargeted set of resources. The middle approach we have adopted enables us to focus on a small set of quality assured sites, which we have checked for relevance and which are likely to be sustained and updated in the future. Using a customised search means that potentially other institutions installing versions of

[5] http://www.google.com/coop/cse?cx=000971387191123125524%3Alworuyth0qs

[6] These include sites such as http://www.learningdesigns.uow.edu.au/ and http://www.educause.edu/, which have a comprehensive series of guides on different technologies and how they can be used in teaching and learning, entitled 'Seven things you should know about....'.

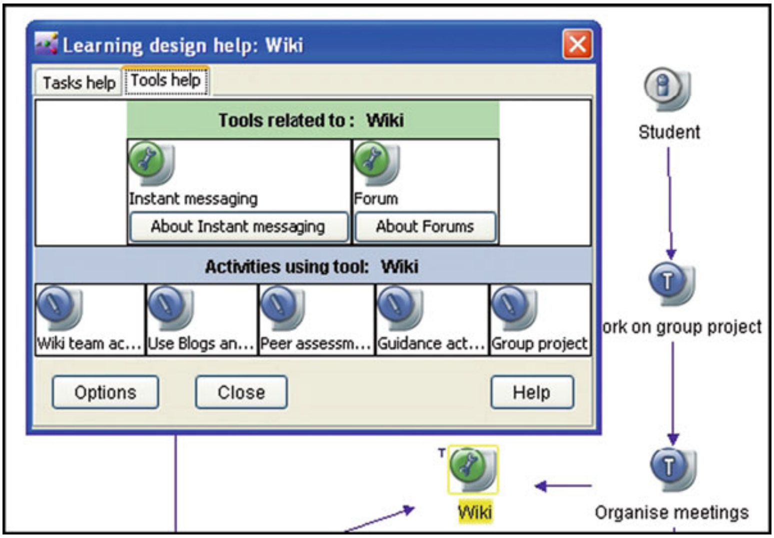


Fig. 9.5 Help relevant to a particular tool

CompendiumLD could choose to select and include their own tailor-made set of resources, which might include institution-specific examples. In our own case, we have a set of tailored resources on tools and their uses within the OU context—'the learn about guides',[7] as well as a set of institutional case studies on specific uses of virtual learning environment (VLE) tools.

Help related to tools that the designer drags and drops onto the window may also be shown. Figure 9.5 shows an example of help presented when the designer selects 'wiki' for the tool type.

Figure 9.6 represents a screenshot of part of the learning activity associated with a third-level environmental course (i.e. the equivalent to the final year of a full-time, 3-year degree course). Two roles are shown (student and tutor) along with their respective tasks. Tools, resources and outputs (i.e. assets) associated with each task are shown alongside, with arrows indicating connections. Students start with a reading activity, followed by posting a message on the forum, next they research the topic and finally they write up the summary. The diagram also shows that the teacher has two activities: firstly to assign each student with a topic to research and then monitoring the discussions in the forum. It is also possible to indicate the approximate times for completion of each task. As icons can link to Web pages, it is possible to link directly to any resources or tools involved.

The Atelier project[8] has also been using Compendium. The project has trialled the use of Compendium in conjunction with a number of other tools, including

[7] Available from the OU's intranet.

[8] http://jiscdesignstudio.pbworks.com/w/page/12458376/Atelier-D+Project

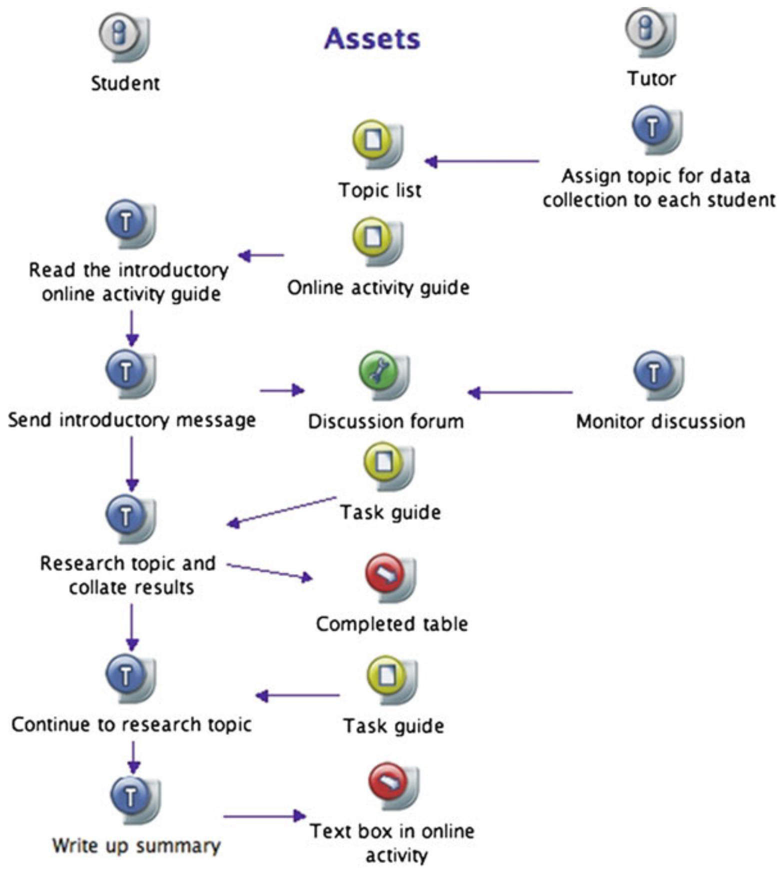


Fig. 9.6 Visual representation of part of a collaborative role play activity

SecondLife, Facebook, Flickr, video conferencing and the Open University, UK's OpenDesignStudio tool. The project looked at the development of a virtual design studio space to support student learning at the Open University, UK. They created a 'design lite' version of Compendium for learners to create and represent designs.

Evaluation

We have undertaken an extensive number of workshops enabling practitioners to explore CompendiumLD. These have included workshops within the OU, as well as externally (including the University of Porto, the University of Cyprus, for the EdTech community in Canada, the University of Guadalajara, a number of institutions in the UK and at numerous conferences). We have also written a number of learning activities based on CompendiumLD for the OU's H800 course, which is part of the Masters in Online and Distance Education (MAODE).[9] As part of the JISC OULDI (Joint Information Systems Committee OULDI) project,[10] we have been working with four other institutions (Brunel, Cambridge, London South Bank and Reading Universities) to explore the use of our learning design tools and resources, including CompendiumLD. This has included the running of a series of workshops, which are available on the Cloudworks site.[11] Data was collected in a variety of ways: via surveys, evaluation of workshops and analysis of comments on CompendiumLD in a discussion forum.

Evaluation of feedback on the use of the tool has enabled us to improve it. We were surprised at how far the participants got in representing their designs, and it did seem during the sessions that CompendiumLD acted as a useful tool to help them articulate and share their thought processes. A few participants, however, commented that they did not find representing their designs visually helpful, stating that, for them, pencil and paper/discussion would be preferable. It is likely that such a focus on the visual aspects of the design process will not suit everyone, but overall most participants were positive both during the sessions and in their evaluation feedback.

Feedback was also positive about our approach to helping teachers/designers consider in more detail the general issues and use of visualisation and its value in improving the practice of design. There were some disadvantages noted regarding visualisation, but these were ones we anticipated. For example, one of the participants suggested that 'some designs may be difficult to describe using this visualisation'. Much of the focus of our use of CompendiumLD during the workshops was designing at the level of an individual learning activity, whereas a number of attendees also saw the value in stressing course-level design techniques and processes as much as for individual activities and felt that this would have a lot of appeal to teachers. However, whilst the principles were appreciated, those new to CompendiumLD did encounter some usability issues and asked for more guidance and support. The next two subsections discuss some of the evaluation feedback and the ways in which CompendiumLD is being used by practitioners and students, respectively.

CompendiumLD has being used in a range of situations with both practitioners and students. The next two sections provide a summary of the evaluations of the use of CompendiumLD.

Use of CompendiumLD by Practitioners

CompendiumLD was used in a series of workshops at Reading University. Maria Papaefthimiou carried out an interview with one of the course participants to elicit how they were using CompendiumLD. One participant stated that he found the tool

[9] http://www3.open.ac.uk/study/postgraduate/course/h800.htm

[10] http://ouldi.open.ac.uk

[11] http://cloudworks.ac.uk

Table 9.1 CompendiumLD download statistics

	Before early November 2009	From 1 November 2009 to mid-April 2010
Total number of downloads (number of downloads by people with different email addresses)	620	332
Number of OU staff (those with an @open.ac.uk address)	86	22
Number of associate lecturers (those with an @open.ac.uk address)	9	9

useful because it enabled him to do what he was doing anyway, but in a more directed way. It also prompted him into thinking:

> We'll probably do it on the board to begin with and then I can translate it, or do it at the same time depending on how easy it is into this kind of thing. Which will make people think about 'How do we set learning outcomes?' will … you know 'How does that link to that?' You know? I think the intention is to use it again regularly as it is – you know, for other jobs to be done…you know… it should be again part of the process.
>
> It makes you think about the different components of the learning process in a way that is structured and it makes people address those issues and discuss them.

What is particularly encouraging is that he concludes the interview by saying that using CompendiumLD has transformed his design practice:

> You could say no it hasn't…but I think it's actually…and my view is that its revolutionised our thinking within the school of Estates and Planning to learning and teaching.

A media designer at the OU used CompendiumLD to draw the tools that were being used in a course. The benefits noted by the designer included that:

- It enabled the course manager and media developer to determine that there was not likely to be excessive demands placed on students.
- It helped consolidate and gather the authors' knowledge of the course in one place (the diagram).
- It was useful for creating an on-the-fly diagram, especially as in this case time was pressing.
- It helped clarify the course structure.
- The diagram represented another vision of the specification (text only specifications often do not communicate what is required that well).

However, he also noted that it would be helpful to have a template to guide the design process and this was one of the reasons for creating and including the swim-lane stencil described earlier.

We have also routinely gathered information about downloads of CompendiumLD. These show that there has been a steady increase in the number of downloads and that the tool is being used by both course teams, associate lecturers, as well as external individuals (Table 9.1).

A number of surveys have been carried out after CompendiumLD workshops; these are of two types: a workshop survey and an impact survey. Cross (2010), reflecting on the lessons learnt from the evaluations, recognised the importance of having good quality training materials to get users started with the tool. One of the positive comments cited was that the basic functionality of the tool is straightforward. In addition, users felt it was valuable to have a background template that can be used to ensure that a design conforms to a set of learning design norms. They found it easy to change the layout. The tool was considered useful for communicating the overall structure of a course and was good for sharing ideas with others. Users liked the drag-and-drop facility and the ability to link nodes, and also the ability to assign time values to tasks. Finally, users liked the fact that it was possible to export designs in a variety of formats.

On the negative side, respondents did not like the fact that there was no normal cut, copy and paste facilities. Some found it difficult to save and export and hence share designs with others. It was felt that it was not always obvious what the icons should be used for. Some were also concerned about the time investment needed to become familiar with the tool and were worried that this time investment might not be worthwhile. However, it is worth noting that a half-day workshop was generally enough to get participants familiar with the tool. Finally, users wanted better quality image exports.

Use of CompendiumLD by Students

This section will summarise a detailed evaluation of the use of CompendiumLD by students on the OU's MAODE H800 course in 2009–2010. The students were asked to download CompendiumLD, familiarise themselves with the tool and then use it to map out a simple learning activity. Andrew Brasher, the CompendiumLD technical developer, carried out the evaluation of the use of CompendiumLD by the students (Brasher 2010). The main points are summarised here.

The analysis focussed on student and tutor postings in the course discussion forum. Ninety-two of the 136 students registered on the course participated in the course forum; of these, 78 created a CompendiumLD map, 2 created a map and a visual representation using another tool, 5 created a visual represented using another tool and 4 did not create anything.

Most students thought that the tool was user-friendly, although it required an investment in time to become familiar with the interface. They liked the way in which colour was used and the different nodes for different elements of a design. They also liked the way in which the tool enabled them to produce a clear, structured output. Students felt that the representation produced was useful in that it did summarise the essence of an activity. Encouragingly, they also felt that the visual representation could reveal aspects of a design that are not obvious from a textual representation. They stated that it was particularly useful for brainstorming a design.

On the negative side, some students found the tool very frustrating and time consuming to learn and use. Others felt that other mapping tools, like MindManager, Cmap or Twine, were more intuitive. Some of the students felt that the representation was essential linear in nature and hence could not be used to produce more circular designs or ones with multiple pathways.

Potential uses that they cited included the following. Firstly, that the tool could be used as a means of sharing design ideas amongst a team of tutors. Secondly, that for a complex design, the CompendiumLD representation could provide a useful mechanism for articulating out the key steps and interdependences. Thirdly, it could be used with students, as a means of representing the course instructions to the students. Fourthly, it could help with planning the overall logistics of a course—particularly for complex courses. Negative comments about the tool included the fact that there is a potential to 'overdesign' and hence get too focused on the mechanism/process and some were very sceptical of the return on investment of mapping out learning activities, stating that a textual lesson plan is quicker to produce and arguably more useful.

Conclusion

The empirical evidence we gathered on practitioners' design practice has informed our development of the CompendiumLD tool. We believe that there is no one perfect 'tool' for design and instead prefer to adopt a pick and mix approach to the design process. Our initial findings of the use of CompendiumLD are positive; however, it is clear that there is a need for further research. In particular, practitioners want examples of good practice and guidance in design. However, previous research shows that representing learning design practice and providing appropriate support for learning designers are both difficult and contested. By bringing together both narrative accounts of learning designs with notational maps showing the design visually, we hope to address and find practical ways of approaching the key issues in this area. CompendiumLD seems to provide an easy to use visual tool to help represent different learning designs.

However, it is also evident that there are a number of drawbacks with a tool like CompendiumLD. For some, the tool is relatively difficult to learn and is not always intuitive to use. We have had considerable success in recent workshops using paper-based printouts of the icons rather than the software per se. Participants liked the tactile nature of the icons, including the ability to be able to move icons around easily. It also meant they could concentrate on using the icons to guide their design process rather than having to spend time on learning how to use the tool. Another issue is that CompendiumLD is not able to represent the full range of design representations, which were discussed in Chapter 8. A better solution would be to have a Web-based tool, which enables users to oscillate easily between the different design views. In addition, despite our best efforts to include scaffolded guidance and support, the help facility at the moment is limited and is not as comprehensive as that available in pedagogical planner tools such as DialogPlus, Phoebe and the learning design support environment (LDSE) discussed in the next chapter. Using Cloudworks as a form of pedagogical wrapper around CompendiumLD is one way of addressing this shortcoming and has been used successful in a number of our workshops. For example, in a workshop at Brunel

University on 9 November 2009, participants shared and discussed the designs they created using CompendiumLD.[12]

Learning Activity Management System (LAMS)

The Learning Activity Management System (LAMS)[13] is both a graphically based tool and a runnable environment for the design produced. Dalziel provides an overview of the development of LAMS (Dalziel 2003). It aims to provide practitioners with an easy to use authoring environment to create structured content and collaborative tasks (called sequences) (Dalziel 2007). The tool consists of a series of activities, such as small-group debate, grouping activities and reflective group response. Users drag activities onto the main design space and then connect them to create a learning activity sequence. Once a sequence has been created, it can be run with a group of students, and as they progress through, the teacher can monitor both group and individual activities. Sequences can be saved and exported and shared with others. Figure 9.7 shows a screenshot of the LAMS tool. The various activities are listed on the left-hand side. These can be dragged and dropped on to the main workspace on the right-hand side. Activities can then be linked together to form a

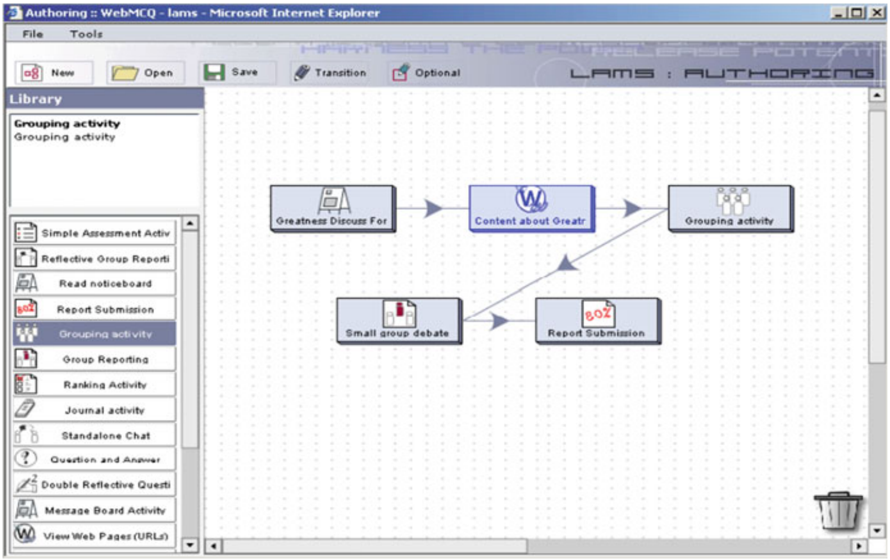


Fig. 9.7 Screenshot of LAMS (Taken from Dalziel 2003)

[12] http://cloudworks.ac.uk/cloud/view/2639
[13] http://www.lamsinternational.com/

sequence, which can then be executed as a runnable object with learners. In addition, there is a LAMS Activity Planner, which provides a set of templates based on good e-teaching practices. Templates include advice on using and repurposing these templates for different learning contexts. The planner can be used:

- To share methods used by others
- To inspire teachers to adopt a new teaching strategy and support them in doing so
- To help teachers make theoretically informed decisions about the development of learning activities and choice of appropriate tools and resources to undertake them
- To provide design ideas in a structured way so that relations between design components are easy to understand
- To combine a clear description of the learning design and offer a rationale which bridges pedagogical philosophy, research-based evidence and experiential knowledge
- As a database of existing learning activities and examples of good practice which can then be adapted and reused for different purposes
- To encode the designs in such a way that it supports an iterative, fluid process of design
- As a mechanism for abstracting good practice and metamodels for learning[14]

The way in which the planner can be used to design e-learning activities is described on the LAMS website.[15]

LAMS has two distinct advantages. Firstly, it is an easy to use, graphically based tool. Secondly, it provides a runnable learning environment as an output from the design process. However, the tool does not include structured guidance for the design process and because it is a runnable tool the focus is on a set of tools. It does not include details on other aspect of design such as learning outcomes, and hence, there is a danger that the design will be technologically driven.

WebCollage

WebCollage was developed by researchers at the University of Valladolid (Dimitriadis 2010). It is a tool for visualising pedagogical patterns. Their interest in particular was on the development of patterns for supporting collaborative learning. They have developed a number of Computer Supported Collaborative Learning (CSCL) patterns, including the jigsaw, pyramid and think-pair-share patterns (Hernández-Leo et al. 2005, 2006). Dimitriadis (2010) describes how the WebCollage

[14] http://wiki.lamsfoundation.org/display/planner/Activity+Planner;jsessionid=F249AF4891583114B57E58C3FD9B44A7

[15] http://wiki.lamsfoundation.org/display/planner/Using+the+LAMS+Activity+Planner+to+design+e-learning+activities

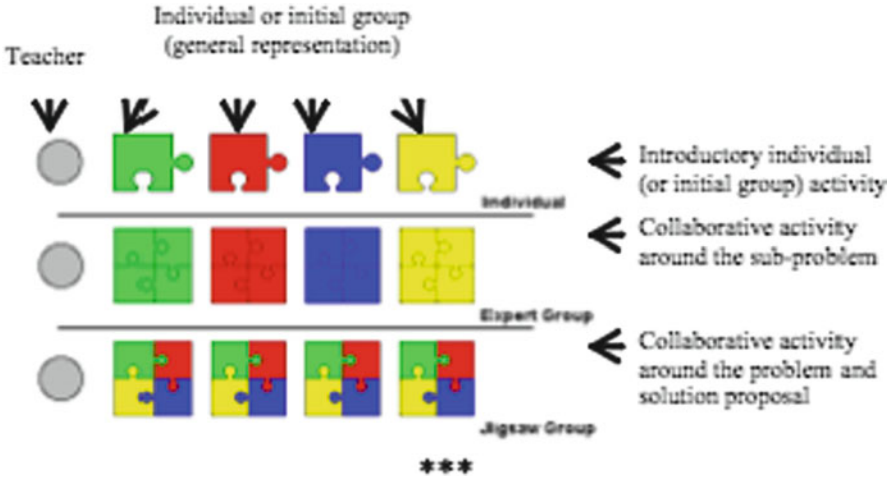


Fig. 9.8 Visualisation of the jigsaw pedagogical pattern (Taken from http://wiki.idspace.mssm.nl)

tool has evolved from earlier tools, namely, Collage (Hernández-Leo et al. 2006) for the support of the authoring phase and InstanceCollage (Villasclaras-Fernández et al. 2009) for the instantiation phase. He goes on to describe an example, where a teacher selects the jigsaw pattern to enable them to work on different components of a complex technical document. In addition, the teacher uses the pyramid pattern to provide a mechanism for enabling the students to come to a consensus.

Figure 9.8 shows the visualisation of the jigsaw pedagogical pattern. This pattern provides a good mechanism for breaking down and dividing up the division of labour associated with a particular investigation. In the jigsaw pattern, students are grouped into teams of four. Each member of the team then goes and investigates a part of the problem being explored. In the second phase, students that have been looking at the same problem come together with others from the other teams who have also being investigating it. They share findings and improve their understanding. In the final phase, they return to their teams and combine the knowledge they have gathered.

Figure 9.9 shows the visualisation of the pyramid pedagogical pattern. In this, each learner individually studies the problem and proposes a solution. They then work in pairs to discuss their findings. Finally, the learners come together at a group level and come up with an agreed solution to the problem.

WebCollage stands for Web COLlaborative LeArning desiGn Editor. It is IMS LD[16] compliant and is a tool for designing collaborative learning based on CLFPs (Collaborative Learning Flow Patterns) on the Web. Further details on the tool can be found online.[17] The tool consists of four main components: (1) general information

[16] http://www.imsglobal.org/learningdesign/

[17] http://www.gsic.uva.es/Webcollage/

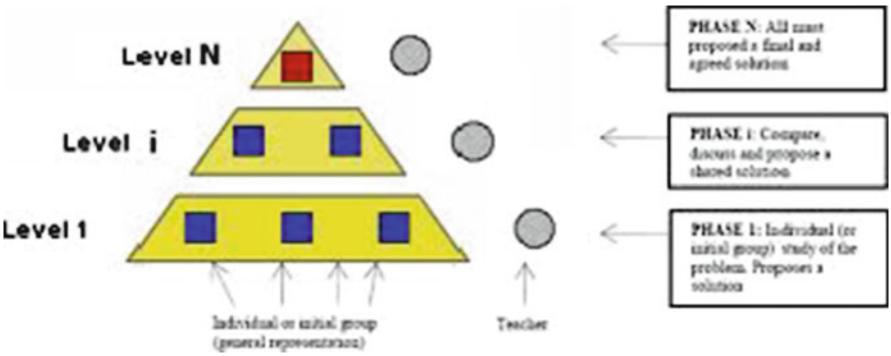


Fig. 9.9 Visualisation of the pyramid pedagogical pattern (Taken from http://wiki.idspace.mssm.nl)

about the design—including the title, any prerequisites and the learning objectives, (2) the learning activity flow, (3) any associated resources and tools and (4) a summary of the produced learning activity. The central part of the tool is the learning activity flow. The user chooses a series of predefined pedagogical patterns and arranges them into a sequence. Figure 9.10 shows part of the output for a learning design to underpin a workshop on learning design. It shows that the design consists of the use of three pedagogical patterns in sequence: brainstorm, think-pair-share and pyramid. The learning objective is to gain a better understanding of learning design and how it can be used to support more informed design decisions. The resources include references to a book on the topic and a link to the Cloudworks,[18] social networking site for learning and teaching. The design in WebCollage can be viewed online.[19]

WebCollage has two distinct advantages. Firstly, it is based on empirically grounded and tested pedagogical patterns, which can help inform and guide the design process. Secondly, the tool provides a clean, visual interface. The patterns are represented as easy to understand visual metaphors, which illustrate the stages involved in each pattern.

CADMOS

CADMOS (CoursewAre Development Methodology for Open instructional System) is a visual learning design tool for creating learning designs.[20] It consists of two components: a conceptual model, which is concerned with the learning

[18] http://cloudworks.ac.uk

[19] http://www.gsic.uva.es/Webcollage/main.php?ldid=184

[20] http://cosy.ted.unipi.gr/index.php?option=com_content&view=article&id=28&Itemid=38

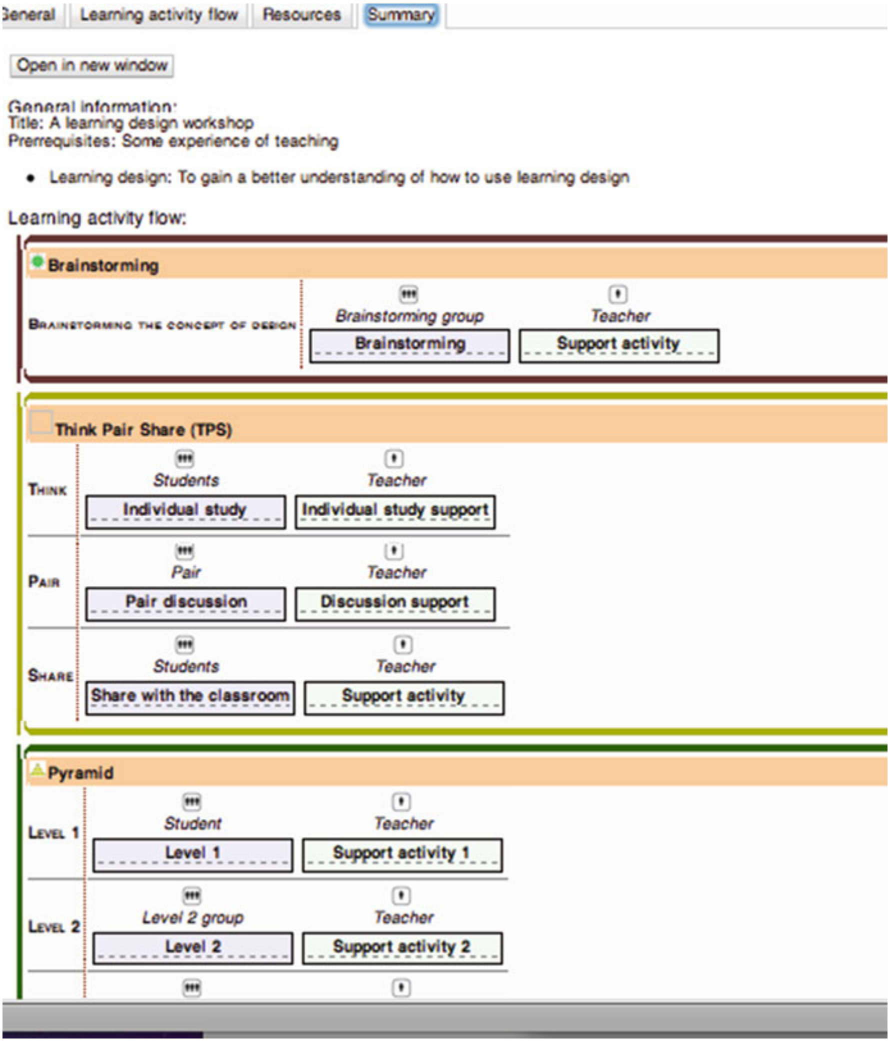


Fig. 9.10 Outputs from WebCollage for a design for a workshop (Taken from the CADMOS help documentation sent by Retalis, S. (2011), personal communication)

activities that the learners and teachers undertake, and a flow model, which contains the navigational patterns (orchestration) of the learning activities. The conceptual model of a unit of learning looks like a concept map or a tree structure, whose root is the title of the unit of learning and whose children are the learning and support tasks. Each task is related to one learning resource (learning object or learning service). The flow model (LD FlowModel) defines the sequence of the execution of the tasks specified at the conceptual model. In particular, it consists of swimlanes, one for each actor specified in the conceptual model. Each swimlane defines the order in which the correspondent actor performs the tasks.

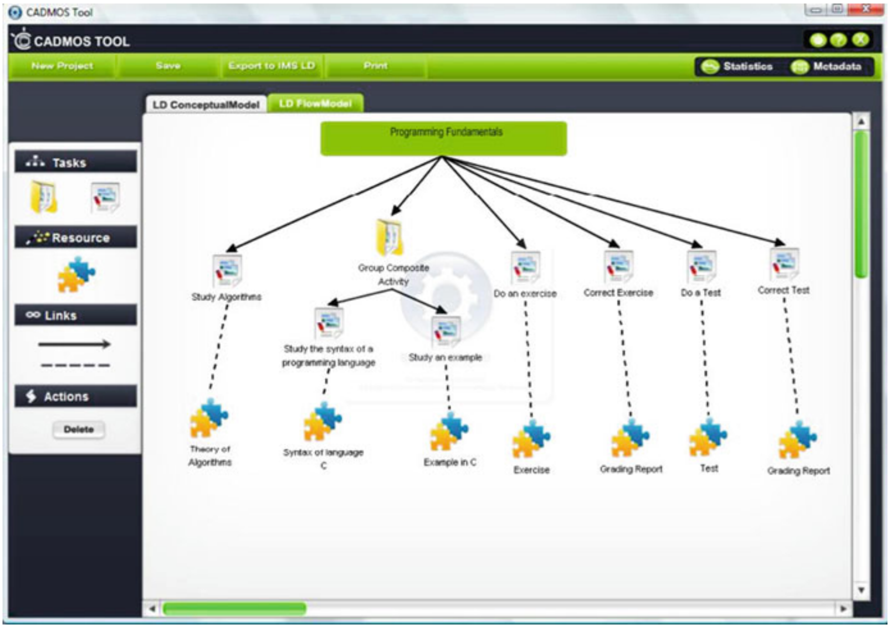


Fig. 9.11 A screenshot of the concept model (Taken from the CADMOS help documentation sent by Retalis, S. (2011), personal communication)

The user has three initial options: to create a new design, to open an existing design or to import an IMD LD design. On starting a new design, the user enters a title, a short description and the learning goals. Any prerequisites can then be included, along with the actors who will perform the task. The user can tab between the conceptual and flow models. On the left-hand side of the conceptual model are listed tasks, resources, links and actions. Figure 9.11 shows a screenshot of a design worked up in the concept model. It shows how task and resources are linked.

Once the design of the conceptual model has been completed, the user can go to the flow model, which will automatically be created by putting the activities of each actor in a swimlane (Fig. 9.12).

Katsamani and Retalis (2011) reporting on an initial evaluation of the tool indicated that overall users liked CADMOS. The majority claimed that were satisfied with both the approach and the tool. All of them said that the use of CADMOS was simple and easy to use to create a learning design. Over half were satisfied with the guidance that was provided to them during the learning design process. The most important remark was that all of the students-designers said that the design approach via the two visual LD modelling views was very helpful. The creation of the conceptual model and the modification of the flow model were considered to be simple and easy. The majority stated that the presence of ready-to-use design templates would have helped them, and two thirds said that they appreciated the fact that they could reuse existing learning designs.

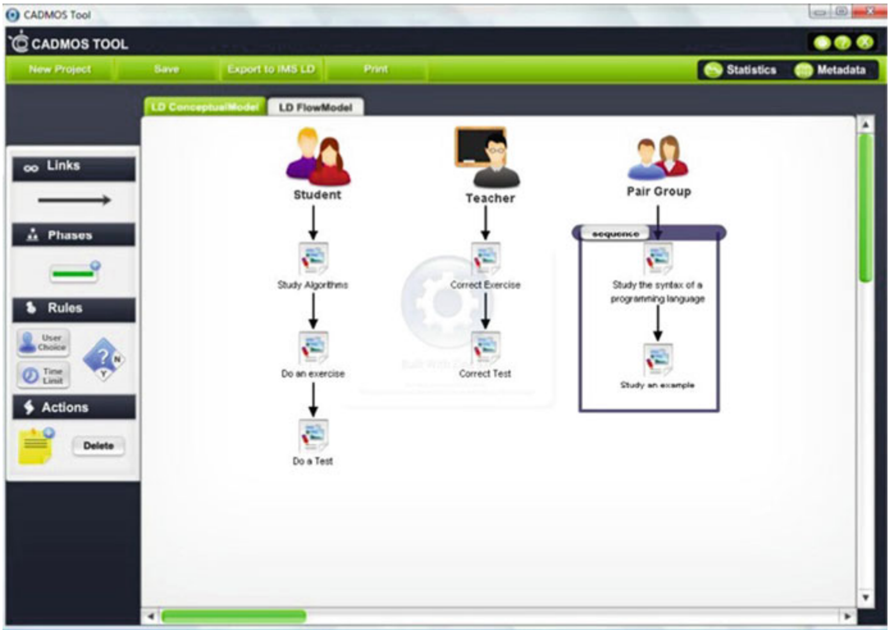


Fig. 9.12 A screenshot of the flow model (Taken from the CADMOS help documentation sent by Retalis, S. (2011), personal communication)

Generic Tools

In addition to the specialised tools described in this chapter, it is also possible to use generic tools to create and represent designs. Mind mapping tools are particularly useful, as they provide a means of mapping out and linking the various components of the design (such as the activities, tools and resources in the learning activity). An example is the Cmap tool,[21] which had a node and link interface. In addition, text can be added to the links between the nodes. Figure 9.13 shows an example of use of Cmap to represent a learning outcomes map (described in the last chapter), for a blended design workshop.[22]

There are a range of other mind mapping and concept mapping tools that could also be used. These include Freemind,[23] Inspiration,[24] Vue[25] and MindManager.[26]

[21] http://cmap.ihmc.us/

[22] http://cloudworks.ac.uk/index.php/cloudscape/view/1912

[23] http://freemind.sourceforge.net/wiki/index.php/Main_Page

[24] http://www.inspiration.com/

[25] http://vue.tufts.edu/

[26] http://www.mindjet.com/

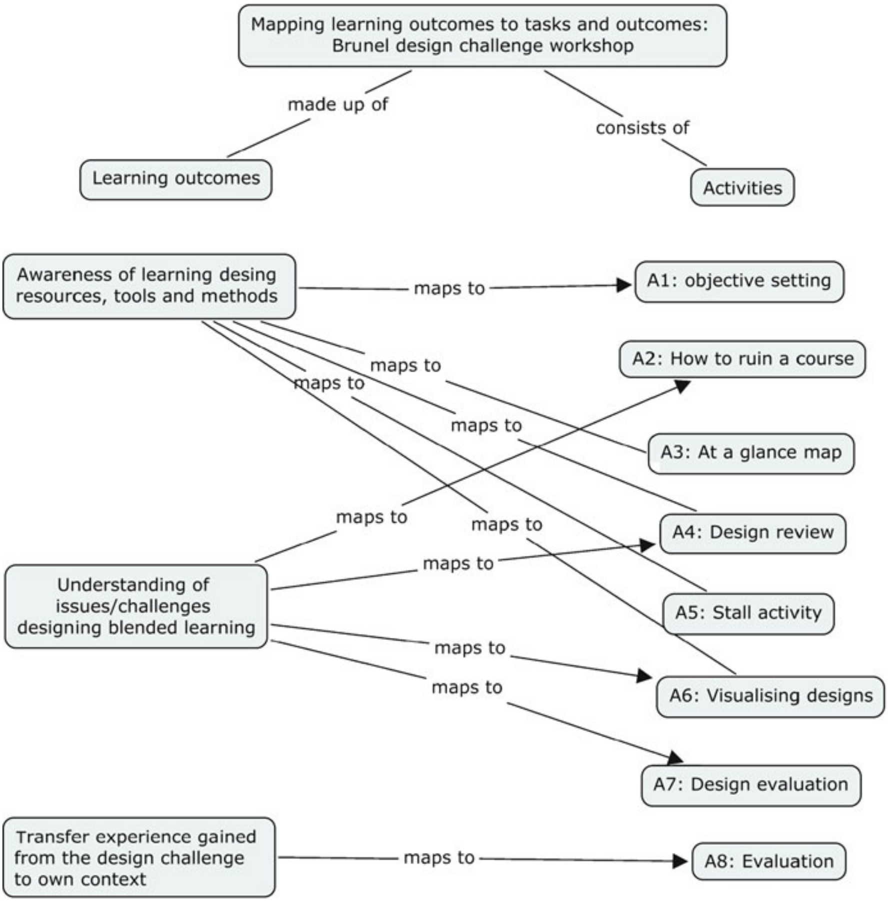


Fig. 9.13 A learning outcomes view mapped in Cmap for a design workshop

They all have fairly similar functionality, some enable the user to include different types of multimedia files and Web links. For a more detailed list of different mind mapping and concept mapping tools, see this Cloudscape.[27]

In addition, spreadsheets can also be used to create some of the representations described in the last chapter. As part of the OULDI work, we have created excel templates to create the course map view, the pedagogy profile and the course dimension views, described in the last chapter. In each instance, the user enters values into predefined tables which then generates the appropriate view.

[27] http://cloudworks.ac.uk/cloud/view/2201

Conclusion

This chapter has described a range of tools for visualising learning designs. It has described the functionality of each, supported by illustrative examples. Where appropriate, data from evaluation of the use of the tools has been included. It is evident that visualising designs is a powerful way of helping teachers to rethink their design practice and make more informed design decisions. Furthermore, the created designs help make the design more explicit and hence sharable. Evaluation of the use of these tools, along with the empirical evidence gleaned through a series of interviews with teachers about their design practices, has given us a richer understanding of the design process and the role of visualisation.

References

Brasher, A. (2010). *Evaluation report on the use of CompendiumLD on the OU's H800 course*. Milton Keynes: The Open University.

Brasher, A., Conole, G., Cross, S., Weller, M., Clark, P., & White, J. (2008, July 25). CompendiumLD – A tool for effective, efficient and creative learning design, LAMS conference, Cadiz, Spain.

Conole, G., Brasher, A., Cross, S., Weller, M., Clark, P., & White, J. (2008). Visualising learning design to foster and support good practice and creativity. *Educational Media International, 54*(3), 177–194.

Conole, G., Falconer, I., Jeffrey, A., & Littlejohn, A. (2006). *LADIE – Final project report*, JJISC final report. LADIE project website and associated project outputs – see http://www.elframework.org/refmodels/ladie. Accessed 21 Sept 2011.

Cross, S. E. (Ed.). (2010). *The learning design initiative institutional project phase two report: Embedding learning design and establishing a reversioning culture*. Milton Keynes: The Open University.

Dalziel, J. (2003, December 7–10). *Implementing learning design: The Learning Activity Management System (LAMS)*. Proceedings of the ASCILITE 2003 conference, Adelaide, Australia.

Dalziel, J. (2007). Building communities of designers. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning* (pp. 193–206). London: Routledge.

Dimitriadis, Y. A. (2010, September 23–26). *Supporting teachers in orchestrating CSCL classrooms*. Proceedings of the 7th Pan-Hellenic conference with international participation: Information and communication technologies in education, Korinthos, Greece. Available online at http://korinthos.uop.gr/~hcicte10/proceedings/K4.pdf. Accessed 11 Aug 2012.

Falconer, I., & Conole, G. (2006). *LADIE gap analysis*. Report for the JISC-funded LADIE project. Available online at http://www.elframework.org/refmodels/ladie/guides/LADiE%20Gap%20Analysis.doc. 22 Feb 2007

Hernández-Leo, D., Asensio, J. I., & Dimitriadis, Y. A. (2005). Computational representation of collaborative learning flow patterns using IMS learning design. *Educational Technology and Society, 8*, 75–89.

Hernández-Leo, D., Villasclaras-Fernández, E. D., Ascensio-Pérez, J., Dimitriadis, I., Jorrín-Abellán, I. M., Ruiz-Requies, I., & Rubia-Avi, B. (2006). COLLAGE: A collaborative learning design editor based on patterns. *Educational Technology and Society, 9*(1), 58–71.

Katsamani, M., & Retalis, S. (2011). *Making learning designs in layers: The CADMOS approach*, IADIS e-learning 2011 conference, Rome, Italy.

Lejeune, A., Ney, M., Weinberger, A., Pedaste, M., Bollen, L., Hovardas, T., Hoppe, U., & de Jong, T. (2009, July 14–18). *Learning activity spaces: Towards flexibility in learning design*. Paper presented at IEEE ICALT 2009 conference, Riga, Latvia.

Okada, A., Shum, B., Simon, J., & Sherborne, T. (Eds.). (2008). *Knowledge cartography: Software tools and mapping techniques* (Advanced Information and Knowledge Processing, Vol. 1). London: Springer.

Villasclaras-Fernández, E. D., Hernández-Gonzalo, J. A., Hernández-Leo, D., Asensio-Pérez, J. I., Dimitriadis, Y. A., & Martínez-Monés, A. (2009, October). InstanceCollage: A tool for the particularization of collaborative IMS-LD scripts, Special issue on new directions in advanced learning technologies. *Educational Technology and Society 12(4)*, 56–70. Available online at http://www.ifets.info/journals/12_4/6.pdf. Accessed 11 Aug 2011.

Chapter 10
Pedagogical Planners

Introduction

This chapter will review and discuss the range of pedagogical planners that have been developed in recent years to guide and support practitioners in making informed learning design decisions. It will begin by discussing the rationale and perceived benefit behind the development of these planners and then focus on a number of specific planners, namely, DialogPlus, Phoebe, the London Pedagogical Planner and the Learning Design Support Environment (LDSE). It will compare and contrast these and conclude by considering where this area of research is likely to go in the future.

The Need for Pedagogical Planners

As discussed elsewhere in this book, there is a gap between the potential of using technologies for learning and their actual use in practice. Practitioners are confused by the plethora of tools that are now available to them and have difficulty creating pedagogically effective learning interventions that make effective use of new technologies. As a result, there has been considerable interest in recent years in the creation of pedagogical planners that provide guidance and support to practitioners as they create learning interventions. The aspiration behind these planners is that they provide structured guidance and resources to help practitioners create learning interventions. They differ from some of the other learning design tools discussed elsewhere in this book (such as visualisation tools, pedagogical patterns and social networking sites), in that the focus is primarily on content and guidance about the

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DOI 10.1007/978-1-4419-8517-0_10,

design process. As will be evident from the examples discussed in this chapter, each tool differs in its design and functionality. Masterman defined pedagogical planners as being:

> Purpose-built to guide teachers through the construction of plans for learning sessions that make appropriate, and effective, use of technology (Masterman 2008a, p. 210).

She argues that pedagogical planners are the equivalent of lessons plans, characterised as:

> [Descriptions of] how learners can achieve a set of learning objectives… how a series of lessons or a single lesson should take place… which activities learners and teachers must carry out, the order in which the activities should be carried out, the circumstances under which the activities will be carried out, how learners will be grouped and what materials or technology may be used. (Van Ed and Koper 2006, quoted in Earp and Pozzi 2006, p. 35)

Conole et al. state that the purpose of a pedagogical planner is to offer a way of enabling teachers to exploit technology whilst creating pedagogically sound activities (Conole et al. 2005). San Diego et al. argue that the main functions of a pedagogy planner are to support planning, decision-making, progressive innovation, analysis, collaboration and administration of learning interventions (San Diego et al. 2008).

Cameron (2011) argues that such tools should emphasise the core elements that need to be considered if a learning design is to be successful and that they should help users adopt a clear, definable structure to their design process. Details include the characteristics of the students, the pedagogical approaches used, the types of technologies and activities, the learning environment, the roles and learning outcomes. She lists a number of uses of these tools:

1. As step-by-step guidance to help make theoretically informed decisions about the development of learning activities and the choice of appropriate tools and resources
2. To inspire users to adopt new teaching strategies
3. To provide design ideas in a structured way, so that the relationships between design components are easy to understand
4. To combine a clear description of the learning design and offer a rationale which bridges pedagogical philosophy, research-based evidence and experiential knowledge
5. As a database of existing learning activities and examples of good practice that can then be adapted and reused for different purposes
6. As a mechanism for abstracting good practice and meta-models for learning
7. To produce runnable learning designs intended for direct use by students
8. To encode the design in such a way that it supports an iterative, fluid process of design

Examples of Pedagogical Planners

The DialogPlus Toolkit

The DialogPlus toolkit was based on an underpinning taxonomy containing the components associated with a learning activity (Conole 2008). It was developed through an extensive requirements specification through a series of sessions with practitioners as they articulated their design process. A range of practitioners were followed over a number of months. This included an expert researcher creating an advance level module on census data, a novice taking over an existing course and an established teacher repurposing an existing module based on evaluation and feedback from students. We followed these individuals through a series of decision-making processes over a period of months in terms of designing a new course, components of a course or an individual learning activity. The focus was to elicit information on each practitioner's thought processes as part of the decision-making and to identify trigger points, support mechanisms and barriers to design. The intended outcomes were to understand better the process of design and the types of representations individuals used to facilitate their design process.

The sessions consisted of a mixture of a 'think aloud' protocol, supported by a series of prompting questions. Questions covered issues such as: What were the key aspirations inherent in the proposed design? What did they want the students to be able to achieve? How did they find information to support their design process? Where did they find resources? How were resources incorporated into the design process? Were they drawing on particular pedagogical models? What difficulties or issues were they encountering at different points in the process? There is a synergy here with the empirical evidence we gathered on design practices as part of the OU Learning Design Initiative discussed earlier in this book.

The data collected enabled us to gain an understanding of the ways in which practitioners worked through the design process. As was also evident from the OULDI interviews, it was clear that the design process is messy, creative and iterative; practitioners think about design at a number of levels and oscillate between the different factors involved in their decision making. From these sessions, the factors involved in design began to emerge and were used to develop an initial specification for the toolkit, as well as an underpinning taxonomy, which described the components involved in creating a learning activity.

At the heart of the toolkit is the notion of a learning activity (LA) (Fig. 10.1), which is defined as consisting of three elements:

1. The context within which the activity occurs—this includes the subject, level of difficulty, the intended learning outcomes and the environment within which the activity takes place.
2. The learning and teaching approaches adopted, including the theories and models used.
3. The tasks undertaken, which specifies the types of tasks, the techniques used, associated tools and resources, the interaction and roles of those involved and the assessments associated with the learning activity.

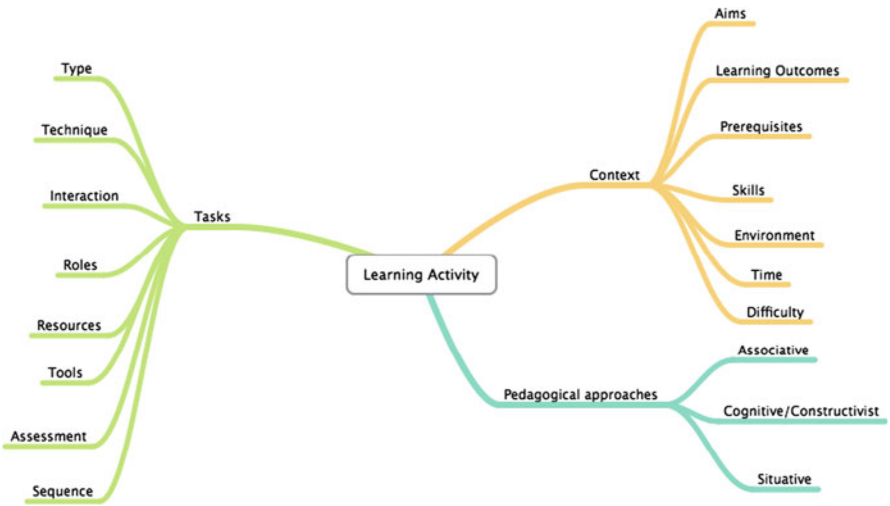


Fig. 10.1 The top-level components of the learning activity taxonomy

The essence of a learning activity is that it must have one or more intended 'learning outcomes' associated with it. Learning outcomes are what the learners should know, or be able to do, after completing the learning activity (e.g. understand, demonstrate, design, produce, appraise). In order to achieve the intended learning outcomes, there is a sequence of tasks that must be completed. Examples of tasks include reading papers, discussing ideas, accessing databases, extracting or manipulating data, answering questions and making decisions. The task 'type' taxonomy is shown in Fig. 10.2, with one of the elements expanded to show the full tree. Task techniques include brainstorming, exercises, fieldwork, role play, reflection or drill and practice exercises. We have identified almost 30 techniques to be stored in the toolkit so that advice can be offered to practitioners on which tasks might be appropriate in different contexts. Interactions possible include individual learning activities, one-to-many, student-to-student, student-to-tutor, group- or class-based interactions. When undertaking tasks, participants in the learning activity (both teachers and learners) are assigned appropriate 'roles', such as individual learner, group participant, facilitator, tutor or presenter. Assessment can include diagnostic, formative or summative assessment or no assessment at all.

'Resources' include Web pages, databases, video streams and interactive maps. 'Tools' include search engines, discussion boards, spreadsheets, media players, blogs, e-portfolios, wikis and social networking sites. The tasks and associated roles undertaken to achieve the prescribed learning outcomes occur within a particular context with characteristics, which include a description of the subject domain (e.g. physical geography or spanish), the level (e.g. introductory), the perceived skills which will be used or acquired (e.g. numeracy, critical analysis), the time anticipated for completion of the activity (e.g. 2 h) and any associated prerequisites

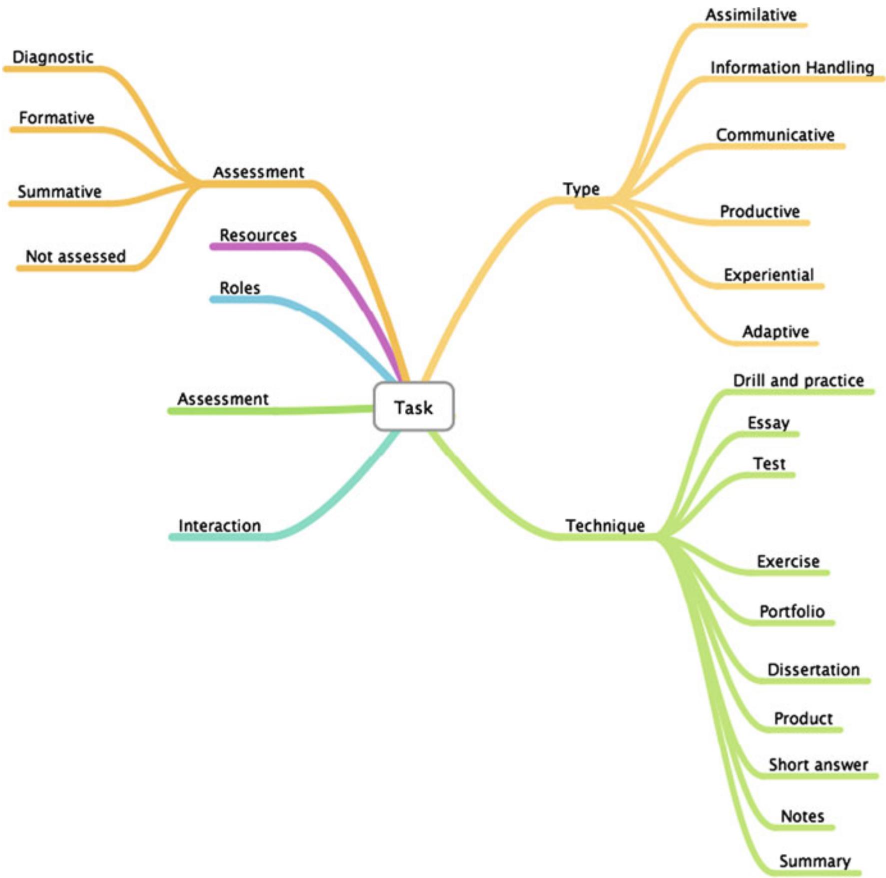


Fig. 10.2 Breakdown of the task component

(e.g. a requirement that the learners have successfully completed an earlier course, or the need for particular skills—e.g. IT skills or a certain level of language skills).

A central premise of this approach is that learning is centred on the set of tasks undertaken by the learner, that constitute the learning experiences that the students will engage in, either independently or collaboratively, in order for them to achieve the intended learning outcomes associated with the learning activity. In designing a learning activity, a teacher usually has a linear sequence of tasks in mind but, especially in an online learning environment, learners will not necessarily follow that sequence.

In addition to context and tasks, the toolkit includes taxonomies and models for learning and teaching approaches based on a review by Mayes and De Freitas (2004), which groups learning theories according to whether they are associative (learning as activity), cognitive (learning through understanding) or situative (learning as social practice) (Fig. 10.3).

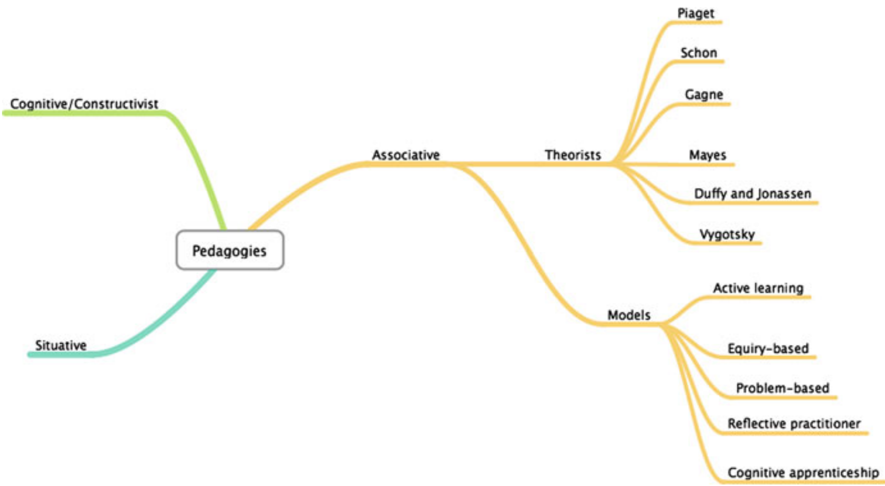


Fig. 10.3 The pedagogy component

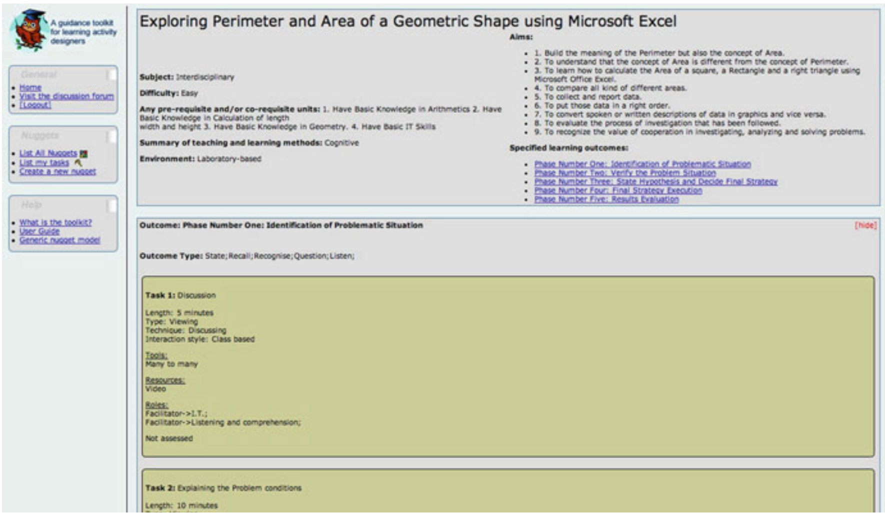


Fig. 10.4 A Learning design in the DialogPlus toolkit

The DialogPlus toolkit is available online.[1] Individual learning activities within the tool are called ‘nuggets’. Figure 10.4 shows part of a learning design ‘Exploring perimeter and area of geometric shape using Microsoft Excel’ created using the DialogPlus toolkit. It documents that the subject is interdisciplinary, difficulty is recorded as easy, prerequisites are outlined and the environment is given as being

[1] http://www.nettle.soton.ac.uk/toolkit/

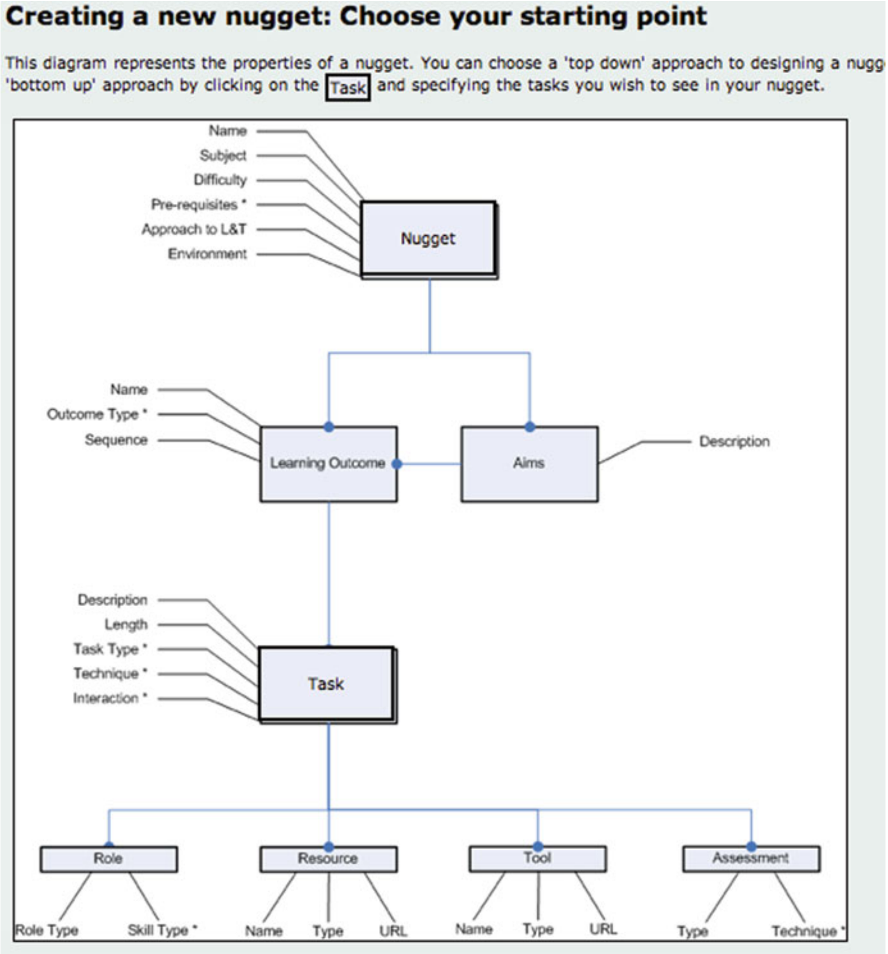


Fig. 10.5 Working through the toolkit

lab based. The aims and learning outcomes are listed, and then on the bottom half of the figure, details of each of the tasks are provided.

Teachers can work through the toolkit in a linear fashion or choose their own path through it (Fig. 10.5).

Figure 10.6 shows the tabs associated with a particular task. For each, there is further information, mapping to the learning activity taxonomy components described earlier, as well as, in many cases, links to additional information and support.

The toolkit was evaluated with geographers involved in the Joint Information Systems Committee/National Science Foundation (JISC/NSF)-funded DialogPlus project[2] and also through a series of workshops with other practitioners at

[2] http://www.dialogplus.soton.ac.uk/

Fig. 10.6 The task panel and associated tabs

conferences. In general, evaluation of the toolkit was positive. Practitioners found the structure and guidance of the toolkit valuable and found it easy to use.

A potential drawback of the toolkit is that despite the fact that practitioners can choose which component to complete when, it still feels like a relatively linear approach to design, which does not resonate with actual design practice. In addition, the format is primarily text based and hence does not harness the power of visualisation tools like CompendiumLD discussed elsewhere in this book. More details on the development and evaluation of the toolkit are available elsewhere (Bailey et al. 2006; Conole and Fill 2005; Fill et al. 2008).

Phoebe

Phoebe adopts a similar approach to DialogPlus by attempting to provide a comprehensive online resource of tips and hints to support decision-making. It is wiki based and provides a valuable set of guidelines on the different components of a learning activity. The following text, available from the JISC website, provides a summary of the tool[3]:

> Intended for practitioners working in Further Education (FE), Higher Education (HE) and Adult Community Learning (ACL), the Phoebe tool brings together the key components of a learning design (or lesson plan), prompts teachers' thinking, allows them to record ideas and requirements, and makes it easy to cross-reference components as they design the activities that make up a learning experience. It offers both flexible and guided paths through the planning process, and provides access to a wide range of models, case studies and examples of innovative learning designs.

There are four possible activities in Phoebe: create/modify your learning designs, view shared learning designs, browse guidance or manage design templates.

[3] http://www.jisc.org.uk/publications/reports/2008/phoebefinalreport.aspx

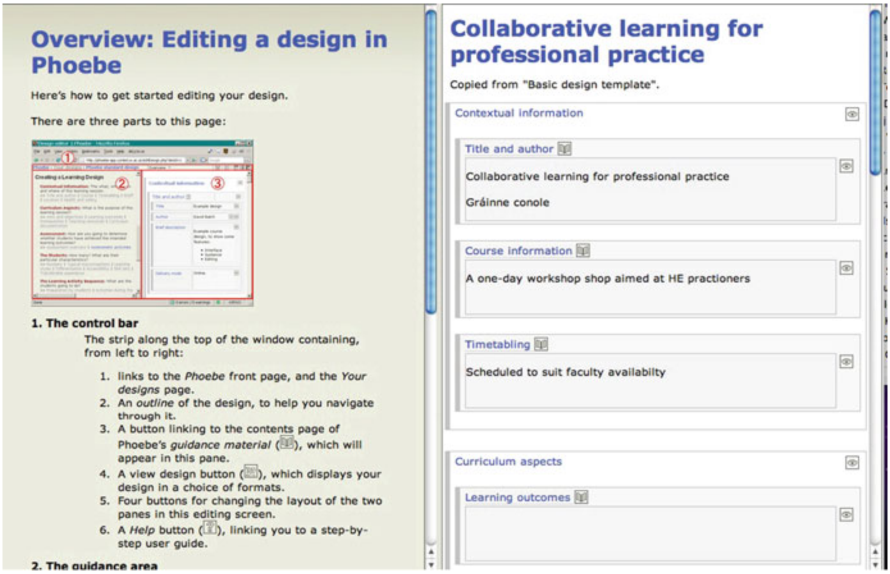


Fig. 10.7 Screenshot of a learning design being created in Phoebe

Figure 10.7 shows part of the screen for a newly created design. The page is split with a template for completion on the right-hand side and associated guidance for each of the boxes on the left-hand side.

One of the strengths of Phoebe is the considerable amount of information that is available to guide the user through completing the various stages of the design. The guidance includes information on contextual information associated with the design, learning outcomes, assessment, the characteristics of the learners, possible learning activity sequences, contingencies to take account of and a space for reflection. There is also extensive information on teaching approaches and techniques. Of particular use are the sections on 'What technologies can I use for a particular activity?' (Fig. 10.8) and 'What can I do with a particular tool?'.

In addition, as with DialogPlus, users can choose to make their learning designs available so that others can use them for inspiration or repurpose for use in another context (Fig. 10.9).

Evaluation of Phoebe revealed that the creation and revision of individual learning sessions appeared to be the most frequent level of granularity of learning design (Masterman 2008b). There was relative consistency in the core components of the task, but a wide variation in the actual approaches adopted. This suggested that a pedagogical planning tool should be capable of supporting a variety of routes through the design, as well as supporting teachers' underlying pedagogic approaches, whether derived from a formal theory of learning (e.g. associative, cognitive or situative) or from personal experience and actual practice.

Receive or take in information	Listen, (skim-)read, scan, view, watch, observe, take notes, annotate	• Blogs • Mobile devices • Digital video • Podcasts • Interactive whiteboards • E-books • Mashups • Webinars • Email • Discussion forums
Define problem	Review current knowledge and understanding, formulate a (research) question, formulate a hypothesis, scope the problem	• Blogs • Concept-mapping tools • Collaborative writing tools • Discussion forums • Wikis
Research, gather information for either a cognitive or practical task	Search, locate, identify/select (relevant information), record	• Blogs • Search engines • Repositories • Social bookmarking • E-books • Collaborative writing tools • Citation tools • Newsfeeds
Develop an understanding of (comprehend) a particular skill, piece of knowledge or concept	Visualise, describe, define, summarise, annotate, classify, select, organise, answer questions (and receive feedback)	• Collaborative writing tools • Blogs • Concept-mapping tools • Discussion forums • Wikis • Spreadsheets
Apply a specific skill, piece of knowledge or concept in a cognitive task	Apply a method, solve a problem, translate, infer, use, select, modify, extend, edit, manipulate, model, simulate, design	• Virtual learning worlds • Spreadsheets • Databases (of online resources) • Simulations

Fig. 10.8 Part of a screenshot of the 'What technologies can I use a particular activity?' section

However, Phoebe suffers from similar drawbacks to DialogPlus in terms of a non-intuitive user interface and a linear, sequential navigational route for the design process. It was evident that the use of such tools is not enough to bring about changes in practice (Masterman 2008b) and it is too easy for practitioners to use them to simply map existing practice. Nonetheless, many users of Phoebe felt that it was a useful tool for reference and reflection and that it might be particularly valuable for novice teachers to guide them through the process of design. The evaluation also found that Phoebe would be best suited for practitioners who adopt a systematic approach to their design practice rather than those who prefer to map ideas out visually.

The London Pedagogical Planner (LPP)

The pedagogical planner is closely linked to Laurillard's conversational framework (Laurillard 2002). The aims of the tool are (1) to give educational practitioners support for innovating with interactive, adaptive, reflective, discursive and collaborative learning designs and (2) to support lecturers and educational practitioners in building learning technologies into courses with tight budgets (Laurillard and San Diego 2007). It adopts a modelling perspective through mapping tasks to resources and attempts to align the design with specific pedagogical approaches. It adopts a

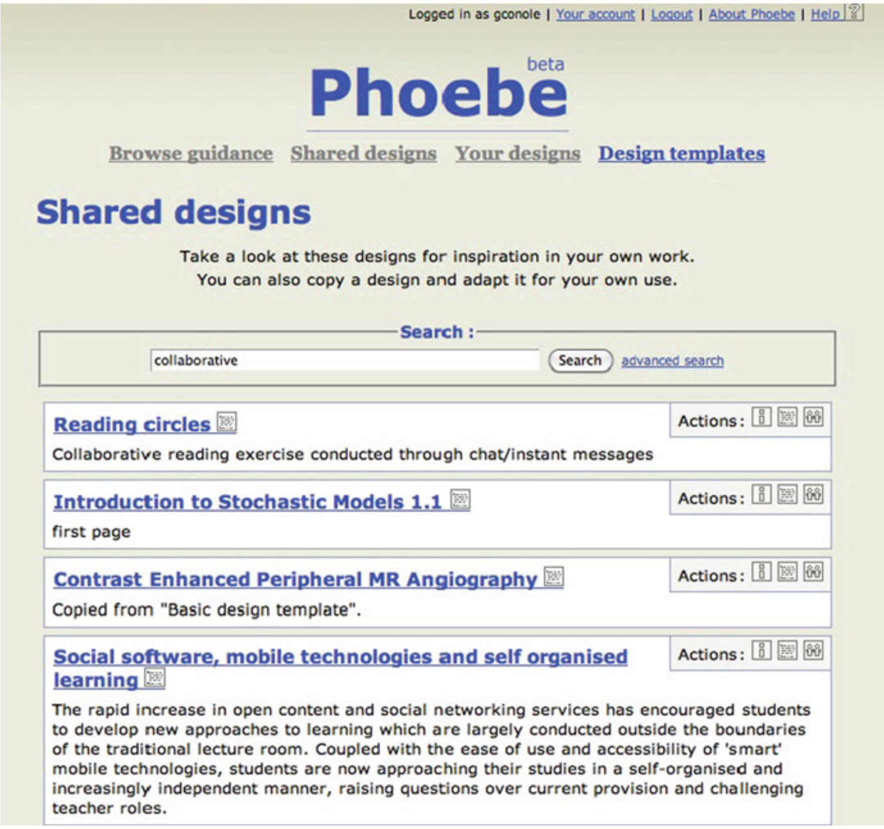


Fig. 10.9 Examples of design for collaborative learning

user-orientated approach and plans to integrate the tool with (LAMS) Learning Activity Management System,[4] a tool for managing and delivering learning activities, which was discussed in Chapter 9:

> This development of the pedagogy planner begins, therefore, with lecturer's needs, in order to bridge the current gap between the technical origins of the 'learning design specification' and the reality of the teaching context. This means it must make use of an existing learning activity design environment, populated with existing support tools, so that collaborating lecturers have the opportunity to test it against their current practice, and engage in further specification of their requirements. Engaging lecturers at the start should help to secure their longer-term involvement and a sustainable product. This iterative approach to user-oriented design should then produce a working model, as well as clear requirements for further development of the learning design specification and its implementation in support tools for lecturers.[5]

[4] http://www.lamsfoundation.org/

[5] http://www.jisc.ac.uk/whatwedo/programmes/elearningpedagogy/phoebeplanner.aspx

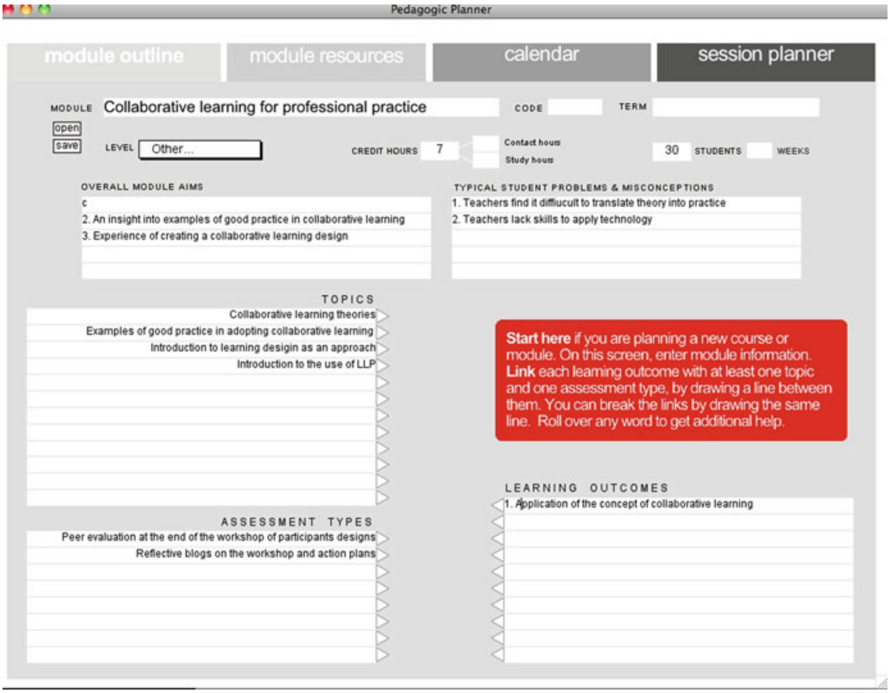


Fig. 10.10 General module information

The Landom Pedagogical Planner (LPP) tool is available to download.[6] The first screen invites the user to complete general information about the learning intervention. It is also possible to ensure that the topics covered, assessment and learning outcomes are mapped, that is, constructively aligned (Biggs 1999) (Fig. 10.10).

The next section calculates resources in terms of student and staff time involved. The user enters the amount of time to be spent by the students on the different types of activities (lecture, tutorial, etc.), and hours are automatically calculated against Laurillard's (2002) types of activity (attending, investigating, discussing, practising and articulating) (Fig. 10.11).

The topics are then mapped to a calendar, and the user can allocate the number of hours across the types of activities and the topics (Fig. 10.12).

The final section enables the user to search the Higher Education Academy case studies database[7] for existing examples of good practice on their topic of interest that they can draw on.

The modelling approach restricts, to some extent, how the tool can be used. In initial versions of the tool, many of the parameters were 'pre-configured'. The planner also focuses more on helping to plan formal, traditional learning activities—with an emphasis on timetabled and sequential work.

[6] http://www.wle.org.uk/d4l/

[7] http://www.connect.ac.uk/casestudies

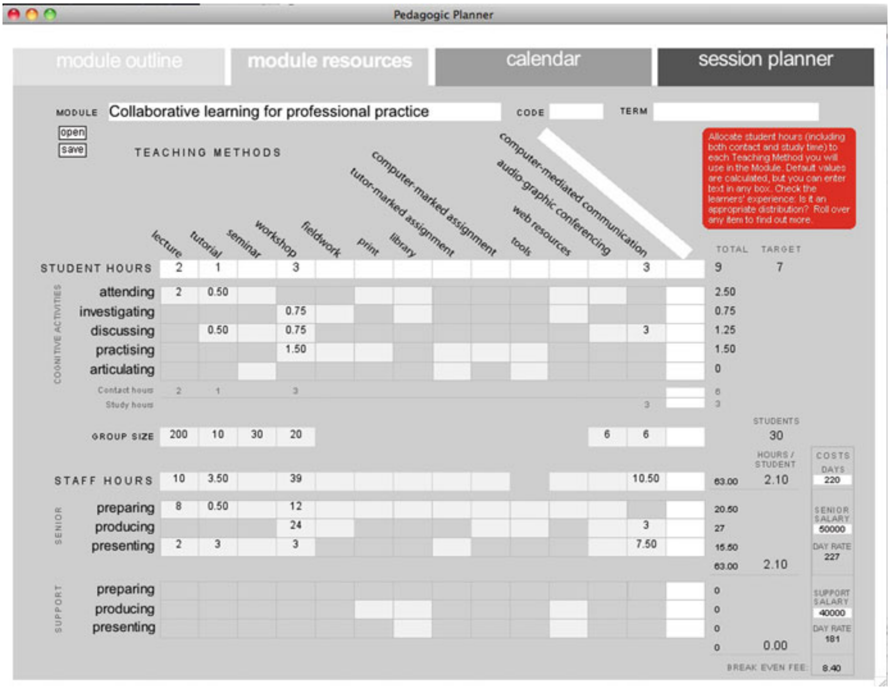


Fig. 10.11 Module resources for students and staff

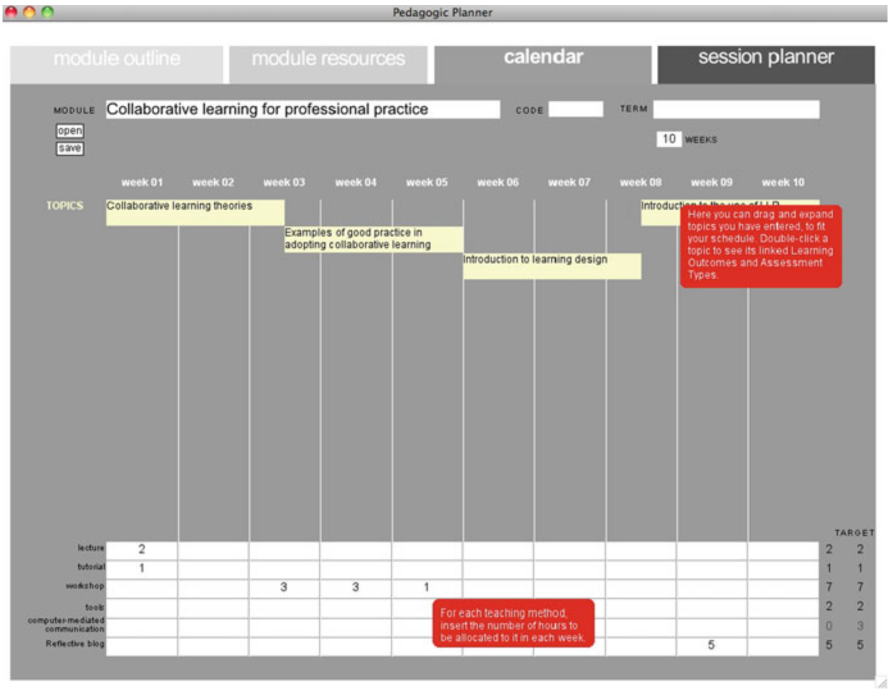


Fig. 10.12 The LLP calendar

Laurillard and Masterman (2010) describe how LPP was based on a model of the critical relationships amongst the components of learning design. The aim of the tool is to support lecturers from the initial curriculum requirements, learner needs and resource constraints, through to the technology-enhanced learning (TEL) activities that their students are expected to engage with (citing San Diego et al. 2008). The planner takes the user through a series of design decisions, displaying their consequences in multiple dynamic numerical and graphical representations of their learning design. The LPP then gives feedback in terms of the likely amount of time each method will need and the different kinds of cognitive activity (attention, inquiry, etc.) that the learner will engage with.

LLP very much starts from existing practitioner experience, in that it focuses on topics and allocation of time across a calendar. One of the drawbacks of this approach is that it is likely to lead to teachers replicating existing practice rather than changing their practice. A more activity-based approach might be better, and it would be useful if the tool contained more explicit examples of different types of learning activities and how these can be mapped to different pedagogical approaches, with examples of how technologies can be used to support these.

The Learning Design Support Environment (LDSE)

The lessons learnt from the development of Phoebe and LPP were taken forward in a Teaching and Learning Research Programme Technology Enhanced Learning (TLRP TEL)-funded research project—LDSE (Learning Design Support Environment)[8]:

> The project is based on four key assumptions: i) teachers will be required to use progressively more TEL; ii) the teaching community should be at the forefront of TEL innovation, and not cede responsibility to other professionals; iii) the development of new knowledge, in this case about professional practice, should be carried out in the spirit of reflective collaborative design; and iv) the same technologies that are changing the way students learn can also support teachers' own learning in new ways. Computer-supported collaborative learning has long been established as an important form of TEL for students; we believe it is equally applicable to teachers' professional development…. We are working with practising teachers to research, and co-construct, an interactive Learning Design Support Environment (LDSE) to scaffold teachers' decision-making from basic planning to creative TEL design.

LDSE[9] is based on the following principles: social constructivism, collaboration, constructionist learning and knowledge building (Laurillard and Masterman 2010). It is possible to create a module, session or activity with the tool. Figure 10.13 shows the main session editing view. Users input general information about the module here, including the name, start and end dates, elapsed time, learning time, number of students, topics and aims. It is possible for users to input their own aims or choose from an existing palette.

Designs can be evaluated in terms of the amount of different types of activities they contain (acquisition, production, practice, inquiry and discussion) and the balance of personalised and social learning involved (Fig. 10.14).

[8] http://www.tlrp.org/tel/ldse/

[9] The tool has now been renamed the 'learning designer'.

Fig. 10.13 The main session editing view

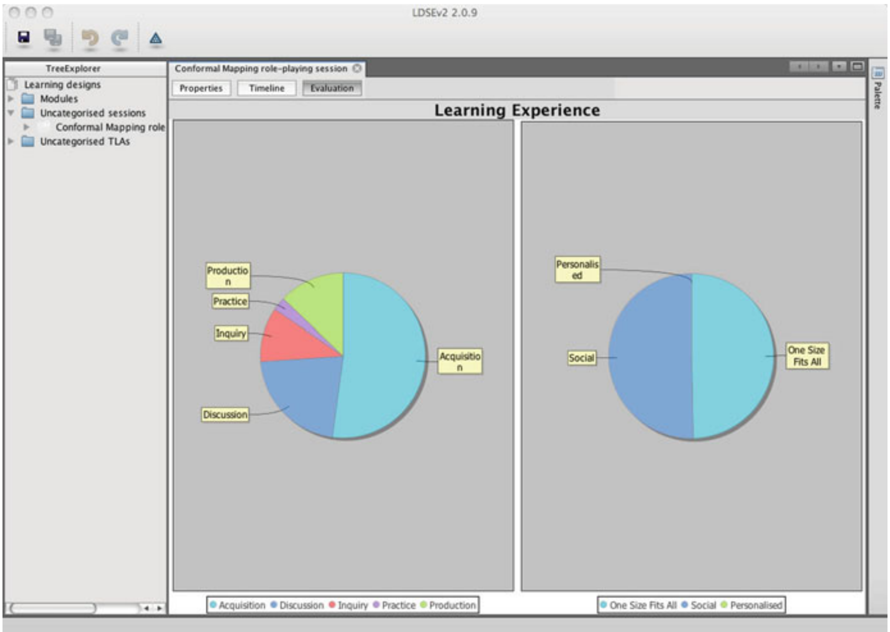


Fig. 10.14 Evaluating learning designs

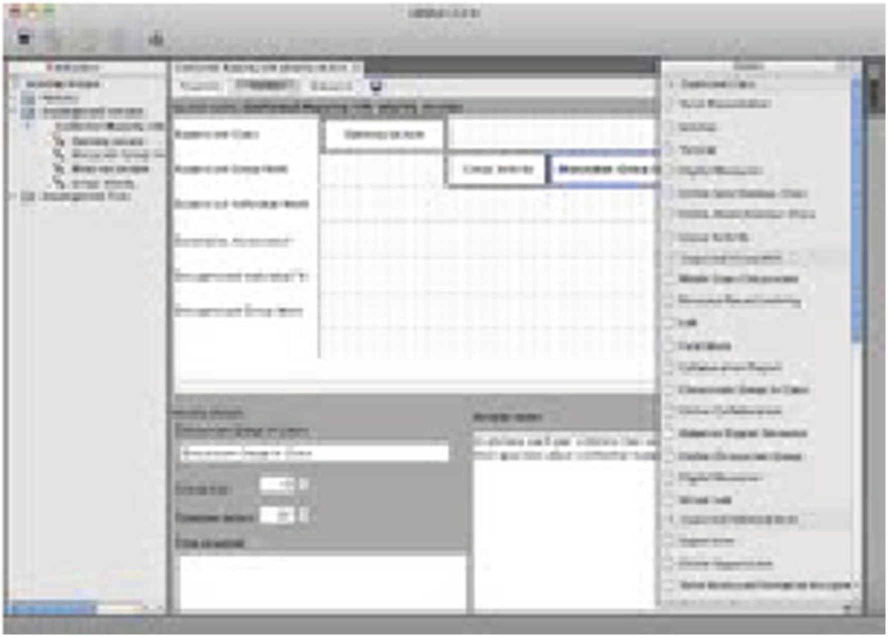


Fig. 10.15 The design timeline

Figure 10.15 shows the session timeline, where different types of activities are mapped across the module calendar. A palette of different types of learning activities is available that users can choose from and additional information for each can be included, such as activity notes and any associated resources for the activity.

The project has also produced a library of existing pedagogical patterns that users can download and adapt.[10] Figure 10.16 shows one example of a pattern 'teach to learn' where students work in small groups to teach each other about activity theory.

Conclusion

Cameron in her review of pedagogical planners (Cameron 2011) concludes that:

> The complex task of learning design for the higher education environment might be improved with good guidance, inspiring examples, and supportive tools. The current range of pedagogical planners acknowledge these factors in their design, along with the potential to streamline the planning process with direct input from the university's databases (such as learner records, timetabling) and learning management system. The planners also provide an opportunity to share examples of good design practice, which can be tailored to meet the lecture's particular requirements.

[10] http://thor.dcs.bbk.ac.uk/projects/LDSE/Dejan/ODC/ODC.html

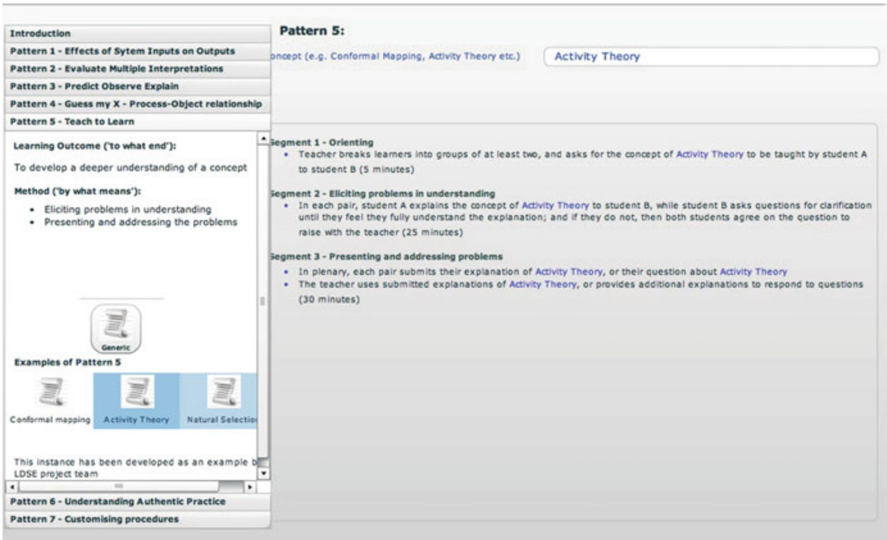


Fig. 10.16 The teach to learn pattern

Both the Phoebe and LLP tools were produced as part of the JISC e-learning pedagogy programme. JISC define 'designing for learning' as:

> Designing for Learning with a practitioner planning focus on e-Learning explores the process of designing, planning, sequencing or orchestrating learning tasks which may include the use of e-Learning tools.

The programme included a review of existing pedagogical theories used in e-learning (Mayes and De Freitas 2004) and the funding of the development of the two pedagogical planners. These were designed to provide practitioners with the practical assistance they need in understanding how best to design activities for their learners. Beetham provides a detailed review of the design for learning programme (Beetham 2008). She provides a summary of some of the key lessons learnt from the programme. Firstly, design for learning practices is very variable. Secondly, educational design tools are not seen by practitioners as pedagogically neutral. Thirdly, there is a need for tools that support collaborative design practices and sharing. Fourthly, practitioners favour a range of design representations, from rich, contextually based ones to generic or simple designs. Finally, she argued that the focus needs to be on people and process, if design is to be transformative.

The four pedagogical planners consist of a combination of examples and supporting text to guide practice; however, they differ not only in the specific content and examples but also in their underpinning approach. Fill et al. (2008) argue that:

> A key challenge in today's technology-enhanced educational environment is providing course designers with appropriate support and guidance on creating learning activities which are pedagogically informed and which make effective use of technologies. 'Learning design', where the use of the term is in its broadest sense, is seen by many as a key means of trying to address this issue.

It is important not to underestimate the complexity and subtlety of the design process. As described in this chapter, and articulated in the learning activity taxonomy, which underpinned the DialogPlus toolkit, pedagogy is contingent on many different factors. This means that assuming that a relatively linear and simple decision-making design tool will be sufficient to scaffold design may be over-optimistic. On the other hand, it is evident that these pedagogical planners do provide valuable support for reflection and exploration, and help scaffold the design of learning activities.

A key issue, identified across the use of all these tools, is the problem of practitioners simply replicating existing practice. Individual beliefs about practice are deeply seated and not always articulated or even realised. Donald et al. describe the Hearing And Realising Teaching-voice (HEART) system, which aims to support teacher's learning design practice by eliciting and depicting the pedagogical beliefs underpinning a learning design (Donald and Blake 2009; Donald, et al. 2009). The system is based on 13 belief/practice dimensions developed by Bain and McNaught (2006). These dimensions are used as the basis for a questionnaire where teachers respond to a five-point Likert scale representing a continuum of teacher-centred to student-centred beliefs and technology-supported teaching practices. The results are displayed using a visualisation tool, Many Eyes (IBM, n.d.). The visualisation illustrates the pedagogical dimensions of the course or learning design. Teachers are then encouraged to reflect on these in order to better understand their inherent pedagogical beliefs.

San Diego et al. (2008) list a number of issues which need to be addressed when designing learning interventions: pedagogical issues, contextual and cultural issues, representation and visualisation issues, the balance of control over data, flexible database design and ownership. They argue that all of these need to be addressed in the development of requirements for a pedagogical planner.

A lot has been learnt about the design process through the development and evaluation of these tools. In particular, it is evident that whilst guidance and support needs to start from existing practice, it is also important to provide a mechanism for changing practice and for getting practitioners to focus more on the nature of the learning activities being created rather than just subject content. All of the tools described in this chapter have an associated library of existing designs, the aspiration being that these can be used for inspiration and as a starting point to repurpose designs for new contexts of use. However, as yet there is little evidence of these designs being repurposed. A similar problem is encountered with the repurposing of OER as discussed in Chapter 12. It is likely that in the near future we will see the continued development and use of these tools, combining the structured guidance available via pedagogical planners, with the power of visualisation through the design tools described in Chapter 9. This might be one way of addressing the shortcomings of these tools. In addition, a lot more will need to be done in order to get the majority of practitioners using these tools routinely. In particular, to get practitioners to use the simple visual design representations described in Chapter 8 and then to use tools such as the pedagogical planners discussed in this chapter to provide a more detailed description of their designs. Such changes in practice are most likely to occur if these design representations and planning tools are embedded into institutional validation and quality assurance processes. Finally, changing practice takes time and needs to be guided, so having the design tools available is not enough, initiatives will also need to be set up to promote their use and adoption.

References

Bailey, C., Zalfan, M. T., Davis, H. C., Fill, K., & Conole, G. (2006). Panning for gold: Designing pedagogically-inspired learning nuggets. *Educational Technology and Society* – Special Issue (January 2006), Theme: Learning Design *9(1)*, 113–122. Available online at http://www.ifets.info/journals/9_1/10.pdf

Bain, J., & McNaught, C. (2006). How academics use technology in teaching and learning: Understanding the relationship between beliefs and practice. *Journal of Computer Assisted Learning, 22*(2), 99–113.

Beetham, H. (2008). Review: Design for learning programme, Phase 2, JISC commissioned report. Available online at http://www.jisc.ac.uk/elp_designlearn.html. Accessed 21 Sept 2011.

Biggs, J. (1999). *Teaching for quality learning at university*. Buckingham: Society for Research in Higher Education/Open University Press.

Cameron, L. (2011, July 7–9). *Could pedagogical planners be a useful learning design tool for university lecturers?* Paper presented at the international conference on information communications technologies in education, Rhodes, Greece.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hershey: IGI Global.

Conole, G., & Fill, K. (2005). A learning design toolkit to create pedagogically effective learning activities. *Journal of Interactive Multimedia Education*, Special issue on learning design (August 2008). Available online at http://jime.open.ac.uk/jime/article/view/2005-8. Accessed 11 Aug 2011.

Conole, G., Littlejohn, A., Falconer, I., & Jeffrey, A. (2005). *Pedagogical review of learning activities and use cases, LADIE project report, JISC e-learning programme*. Southampton: University of Southampton.

Donald, C., & Blake, A. (2009, December 6–9). *Reviewing learning designs with HEART: A learning design support strategy*. Paper presented at the ASCILITE 2009 (pp. 1211–1213). Auckland, New Zealand. Available online at http://www.ascilite.org.au/conferences/auckland09/procs/donald-interactive-session.pdf. Accessed 11 Aug 2011.

Donald, C., Blake, A., Girault, I., Datt, A., & Ramsay, E. (2009). Approaches to learning design: Past the head and the hands to the HEART – Of the matter. *Distance Education 30(2)*, 179–199. http://www.informaworld.com/110.1080/01587910903023181

Earp, J., & Pozzi, F. (2006, December 6–8). Fostering reflection in ICT-based pedagogical planning. In R. Philip, A. Voerman, & J. Dalziel (Eds.), *Proceedings of the first International LAMS conference 2006: Designing the future of learning* (pp. 35–44). Sydney, Australia.

Fill, K., Conole, G., & Bailey, C. (2008). A toolkit to guide the design of effective learning activities. In P. Rees, L. Mackay, H. Durham, & D. Martin (Eds.), *E-learning for geographers*. Hershey: IGI Global.

IBM. (n.d.). *Many Eyes*. from http://services.alphaworks.ibm.com/manyeyes/. Accessed 11 Aug 2011.

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.). London: RoutledgeFalmer.

Laurillard, D., & Masterman, L. (2010, July 15). *Implementing a constructionist approach to collaboration through a learning design support environment: Balancing users' requirements with researchers' theory-informed aspirations*. Paper presented at the European LAMS and Learning Design Conference, Wolfson College, Oxford University.

Laurillard, D., & San Diego, J. P. (2007). *Development and testing of a 'Pedagogic Planner'*. Paper presented at the Center for Distance Education (CDE) fellows conference, Institute of Education, University of London.

Masterman, L. (2008a). Activity theory and the design of pedagogic planning tools. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies* (Vol. 1, pp. 209–227). Hershey: Information Science Reference.

Masterman, L. (2008b). *Phoebe pedagogy planner project: Evaluation report, JISC E-learning and pedagogy programme*. Oxford: Oxford University.

Mayes, T., & De Freitas, S. (2004). Review of e-learning frameworks, models and theories, JISC e-learning models desk study. Available online at http://www.jisc.ac.uk/uploaded_documents/Stage%202%20Learning%20Models%20(Version%201).pdf. Accessed 11 Aug 2011.

San Diego, J. P., Laurillard, D., Boyle, T., Bradley, C., Llubojevic, D., Nuemann, T., et al. (2008). Toward a user-oriented analytical approach to learning design. *ALT-J, 16*(1), 15–29.

Van Ed, R., & Koper, R. (2006). Testing the pedagogical expressiveness of IMD LD. *Educational Technology and Society 9(1)*, 229–249.

Chapter 11
The Nature of Openness

Introduction

Wiley suggests there has been a shift in the context in which education takes place: from analogue to digital, from tethered to mobile, from isolated to connected, from generic to personalised, from consuming to creating and from closed to open (Wiley, n.d.). This chapter focuses on the last of these shifts. It explores the impact that an increasingly 'open' technologically mediated learning environment will have on learning in the future. In a world where content and expertise are increasingly free and where services are shifting to the 'cloud' (Katz 2008), what are the implications for education?

Facets of Openness

The chapter takes a particular position on the notion of 'openness'; considering it from a broad perspective covering each major phase of the academic life cycle, namely, design, delivery, evaluation and research.

Open Design

What would a vision of a truly open approach to design mean; beyond open educational resources (OER) towards a more explicit representation and sharing of the whole design process? A scenario of the future might be as follows:

> A newly formed course team brainstorm their initial ideas for the course, using visual representations, which make conveying and sharing the essence of their ideas easy. They share this openingly with others, through appropriate Web 2.0 technologies. They invite comments – from other subject experts, from past students, and from potential students. They use the Web 2.0 spaces to continue to develop and refine their ideas; incorporating peer critique and leaving a visible audit trail of their design decisions and the development process.

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_11,

Open Delivery

With a shift towards more open learning and teaching practices, the boundaries between traditional, formal educational contexts and other non-formal and informal learning contexts are changing. What would adopting a more open approach to delivery mean? What will be the impact of mixing institutional systems with freely available services? How can a more dialogic engagement for learning and teaching be fostered, starting as part of the design process described above, through to delivery and assessment? How might the vision of the use of open educational resources be realised?

Open Evaluation

How can we harness and utilise the data we collect about learners on our courses? How can we build on the understanding developed as part of the learner experience research work (Sharpe et al. 2010)? What new methodologies and approaches might we develop to gain new insights into the impact of a changing technological context for learning?

Open Research

In the last decade, the open access movement (OAM) has emerged as a means of academics making their research outputs publicly available rather than in closed publishing journals. This raises the issue of what will be the impact of the open access movement (Harnard et al. 2004) for learning, teaching and research? How can we capitalise on the rich research data, which is now being made available on a global scale? How can we move to adopting more open approaches to research, open bibliographies and citations, making research outputs available online? What would it mean to make raw data publicly available for others to interrogate and use?

Principles

Underpinning the facets of openness described above is a set of five principles. Firstly, adopting more open practices will mean being ‘open’ in as broad a sense as possible. Secondly, it supports and enables dialogue around learning and teaching ideas and designs. Thirdly, one of the key aspects of social and participatory media is their ability to harness the power of collective aggregation, which has the potential to provide cumulative benefit for both learners and teachers. Fourthly, there are evident benefits of sharing good practice and peer critiquing, which supports good digital scholarship (Weller 2011). Fifthly, adopting open practices will encourage serendipity, lateral thinking and new perspectives, hence fostering creativity.

Understanding the nature of openness in the context of a rapidly changing educational context is important from a research perspective but also has a number of practical, tangible benefits. Firstly, a better understanding of how OER (open educational resources) can be designed and repurposed should lead to a much greater uptake of their use. Secondly, adopting a more open approach to the design process should lead to better sharing of learning and teaching ideas and the creation of a vibrant community of scholarship around learning and teaching. Making designs more explicit will help the meaning of the designers to be more easily conveyed to those delivering courses and to learners. Thirdly, capitalising on the outputs of the open access movement will help us to shift to a more research-led and evidence-based approach to teaching, ensuring that learning is informed by the latest research findings. Fourthly, adopting such an approach is likely to have an impact on learning and teaching in a number of ways. It is likely to lead to more transparency in terms of how our educational provision is designed, delivered, supported and evaluated. It should result in better sharing and discussion of learning and teaching, leading ultimately to a cultural change in practice. It will provide a practical instantiation of what open practices mean. Finally, it will provide a mechanism to showcase e-learning research and practice by foregrounding exemplars of good practice in learning and teaching and in demonstrating how 'openness' can be instantiated using innovative tools and new approaches.

Defining Openness

Openness is a difficult term to define, particularly in its application to technology mediation for learning and teaching. Dictionary definitions[1] include accessible to all, unrestricted in terms of participation, free from limitations, boundaries or restrictions and available (obtainable and for use). All of these definitions can be applied to the notion of open practices in an educational context. Weller argues that openness is both a technical feature and a 'state of mind' (Weller 2011). It is about the practice of sharing content as a default. Weller cites a number of strategies for promoting openness: (1) in terms of making the economic case for adopting open practices, (2) by creating robust reward schemes to enable teachers to engage with and adopt open practices, (3) through clear articulation of the benefits to an individual academic of being open and (4) by providing easy routes to engaging and using new technologies.

Siemens posed a number of questions on the nature of openness and is concerned that the term is becoming diluted and misused (Siemens 2009). What does it mean to be open? What is an open methodology? What does openness look like in relation

[1] http://www.thefreedictionary.com/openness

to technology, information, learning content, administrative systems (transparency of the student record and related data collection by an institution) and pedagogy?

Wiley articulates his position on openness and its perceived benefits (Wiley 2010). Firstly, in relation to the notion of 'open' in OpenCourseWare courses,[2] he argues that this means the course materials are licensed with an open licence from the OpenCourseWare (OCW) consortium website,[3] that is, a free-to-access, online digital publication of high-quality university-level educational materials. Secondly, he sites Carson's extensive list of the benefits of openness (Carson 2010). These include improving personal knowledge, learning new teaching methods, improving the quality of instruction, saving time in preparing to teach new students, adapting teaching materials for personal use, improving skills as a lecturer, improving the interactivity of classes and seeking ideas on how to design a new course.

Characteristics of Openness

Written before the emergence of social and participatory media, Rumble (1989) argued that it was important to distinguish between open and distance education and describes 18 characteristics of openness that he classified into five categories: (1) access-related criteria (finance, age and prerequisite requirements, etc.); (2) place and pace of study; (3) means—referring to choice of media to be used; (4) the structure of the programme—defining learning objectives, what content to skip, etc.; and (5) support services.

As discussed in Chapter 4, one of the reasons why it is important to critique the notion of openness is that it is at the heart of the nature of Web 2.0 practices. Straub lists open societies, open innovation, open standards, open ecosystems, open source and open architectures as examples of different facets of openness. He suggests that the idea of openness is emerging as a dominant attribute of key developments in our economic and social fabric (Straub 2008). Hence, better articulation of the nature of openness will enable us to more effectively harness new technologies for learning and teaching. Cited in Bartolomé (2008), Cobo and Pardo list seven principles of Web 2.0: the Web as a platform, harnessing the collective intelligence, managing database relevance, not more software versions, lighter programming, multi-devices orientation and a semantic Moore's law (Cobo and Pardo 2007). Anderson lists six ideas behind Web 2.0: individual production and user-generated content, harnessing the power of the crowd, data on an epic scale, the architecture of participation (O'Reilly 2004), network effects and openness (Andersen 2007). Straub (2008) suggests that the following values are associated with openness: tolerance, individual freedom, lifelong learning, participation, empowerment and cooperation.

[2] OpenCourseWare is the term applied to online course materials created by universities and shared freely with the world via the Internet. See also http://www.ocwconsortium.org/.

[3] http://www.ocwconsortium.org/

Freire (2008) discusses the implications of using Web 2.0 technologies for educational institutions and in particular some of the associated challenges posed by them. Firstly, there is the issue that learners and teachers, on the whole, are reluctant to embrace the potential of these new tools. Secondly, there is a lack of incentives or rewards to use them. Thirdly, universities have legacy technology systems, which are out of kilter with new technologies. Fourthly, universities, on the whole, are adverse to innovation and entrepreneurship.

Weller argues that if we were starting an Open University now, it would be constructed very differently and that it would embrace the notion of openness using, for example, open source software, open educational resources, open approaches to teaching, open courses, open research, open systems, open scholarship and open technology (Weller 2009). He argues that the cost of sharing has disappeared and that sharing can transform practice. Through sites like SlideShare, presentations can become social objects. Flickr and YouTube enable teachers to create and share rich multimedia resources for their learners. Weller (2009) puts forward five principles of social learning: the power of embedding, simple with reach is better than complex with a small audience, sharing provides a motivation for participation, it makes sense to start simple and let others build on top and complexity comes from the network not the application. He considers and discusses the question of how we can apply these principles to transform education.

Bates argues that open learning is primarily a goal or an educational policy and that the essential characteristic of open learning is the removal of barriers to learning (Bates 2005). He goes on to state that open learning has particular implications for the use of technology. However, openness is rarely found in its purest form. No teaching system is completely open (e.g. a minimum level of literacy is required) and few students ever study in complete isolation.

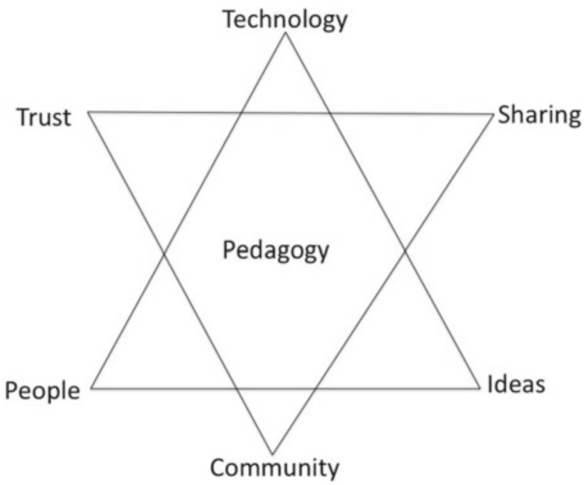
Weller suggests there are three features of today's Internet: openness, decentralisation and robustness (Weller 2007). He argues that successful Internet developments usually display all three of these characteristics, and he cites Napster,[4] which provided access to free online music, and also more generally the use of blogs and open source software, as examples. In terms of openness, he argues that e-learning communities are necessarily open in that all individuals are encouraged to contribute, and the ethics of collaborative activity usually dictate that all contributions are valid. Access is possible from different locations and devices and it is open in the sense of open to the flow of material.

The OU's Supported Open Learning (SOL) Model

McAndrew et al. (2010) discuss the implications of adopting more open practices at an institutional level. They draw on the creation of the Open University, UK, which was established as a means of expanding access to higher education. The OU

[4] http://www.napster.co.uk/

Fig. 11.1 The Open University SOL model (Diagram reproduced from Bean 2010)



developed a model of Supported Open Learning (SOL) (McAndrew and Weller 2005; Tait 2003; Tait and Mills 2003). Open learning means that students learn in their own time by reading course materials, working on course activities, writing assignments and working with other students. Supported means support from a tutor and the student services staff at regional centres, as well as from centralised areas such as the library or the Open University Students Association. The OUUK SOL model is described as being based on three factors:

- Distance or open learning (learning individually through readings, activities and assignments and working with others)
- Resources (course texts, DVDs, home experiments, interactive materials, Web-based materials, TV programmes)
- Systematic support (via an allocated course tutor, assignment to one of the OU's 13 regional centres, central library and IT support, plus regional tutorials, day schools and online support)

A more up-to-date and technology-aligned description of the OU model was presented to the Higher Education Funding Council of England (HEFCE) online e-learning task force (Bean 2010; Bean and Yeo 2010). This includes a diagrammatic representation (Fig. 11.1), with the SOL model defined as follows:

- The relationship between technology, people and ideas. The focus is on maximising the connection (and benefits) between these, delivered through technology-enhanced learning. The skill is in striking the right balance between these elements. Pedagogy is seen as a way of bringing technology into the service of people and facilitating the communication of ideas.
- The relationship between trust, open sharing and community. With the plethora of social tools, the concept of trust is now concerned with reliability and security

and not just the integrity of communicating properly researched material. In terms of sharing, collaboration and group work are seen as important elements and indeed have always been a prominent feature of OU courses. Today's technology refreshes the meaning of 'open', enabling easier sharing and co-construction of resources between students. Finally, community emerges between people and ideas, as people come together around shared interests and goals. Pioneering the use of computer conferencing in the early 1980s enabled the OU to support its learning communities electronically. Modern technologies simply make it easier—the principles are the same.

McAndrew et al. (2010) suggest that the Open University had several motivations to working openly, with a key one being to experiment and engage with open provision. The experience of the creation of the OU's open educational resource repository, OpenLearn, along with putting OU materials available as podcasts on iTunesU has been very successful, increasing the brand recognition of the OU, as well as resulting in new students signing up for OU courses. They go on to list a range of more general organisational benefits of adopting open practices, including:

- Enhancing the institution's reputation
- Extending the university's reach to new users and communities
- Recruitment of students from those who use open educational resources repositories
- Supporting widening participation
- Providing an experimental base of material for use within the university
- Accelerating uptake and use of new technologies
- Acting as a catalyst for less formal collaborations and partnerships

McAndrew et al. (2010) conclude by saying that they have a view of openness that sees it as an enabler for sharing and communication that then impacts on both the ways we learn and the ways we research. They also believe adopting open practices can act as an agent for change. Newbould (2010) commenting on a draft of this chapter wrote:

One of the most distinctive features of SOL in the OU, from its earliest beginnings, was the openness and transparency of its teaching. There are three elements to this:

- Each student is provided with a study guide, which serves as a route map for study, with detailed advice on what is needed to begin study (the starting point); what the learner will need to know along the way and how they will recognise their learning (stated learning outcomes); and the destination of the learning journey (teaching objectives). This was not common or current practice elsewhere in 1971 when the first students began studying with the OU.
- The second feature was that, until the late 1990s, most courses relied heavily on radio and TV broadcasts, which were openly, publicly available to anyone who saw the original broadcast or was able to record it.
- There was a third, unexpected consequence: OU materials were routinely excellent and academics in other universities found them invaluable in delivering their own, face to face but largely unsupported courses. Soon, there was a market in photocopied OU print

> materials and rogue recordings, which circulated openly, though rarely acknowledged, and broke all copyright laws at the same time. This experience made it easier for the University to embrace OERs and to launch its own initiative, OpenLearn in 2006!

The OU's SOL model is a good illustration of openness in practice. Despite being developed for a distance education institution, it demonstrates the value of adopting open practices, and indeed, many of the principles are transferable to other educational institutions, particularly as campus-based institutions are now increasingly incorporating a range of technologies as part of their course provision. It is also interesting to see how the SOL model has developed and adapted as social and participatory media are increasingly incorporated into the design, delivery and support of OU courses.

Applying Openness

In this section, I will provide some examples of open practices across the four facets outlined at the beginning of this chapter, namely, open design, open delivery, open evaluation and open research.

Open Design

Open design is concerned with opening up the process of designing learning interventions, making the design process more explicit and hence shareable. The concept of open design is discussed extensively elsewhere in this book. In particular, in the first chapter, I introduced the open learning design methodology. Chapter 8 described a set of design representations, which can be used to foreground different aspects of the design of a learning intervention. I have argued that we need to shift from seeing design as an implicit, belief-based view to one that is explicit and design-based. Adopting more open design practices means that designs can be more easily shared and discussed with others. Making designs explicit through the design representations described in Chapter 8, both helps guide the designer through the process of designing learning interventions, as well as enabling them to see the design more explicitly and hence make more informed judgements as to the efficacy of the design. It is important to be clear that open design is both a process and a product. In addition, an important aspect of open design is the dialogic element; there is immense benefit in practitioners being able to share and discuss learning and teaching ideas and designs. Social and participatory media offer a plethora of ways in which practitioners can do this. Chapter 15 describes a specialised learning and teaching social networking site, Cloudworks,[5] which has been explicitly developed

[5] http://cloudworks.ac.uk

for this reason. The chapter describes both the vision underpinning the site and the new patterns of user interaction and communication that have emerged on the site.

Open Delivery

Wiley cites a number of examples of how to adopt open practices: opening students' work to a wider audience through blogs, learners using open materials, writing their own teaching materials, putting teaching materials and course syllabi in a wiki and then encouraging students to contribute and adopting an open participation approach in class (Wiley, n.d.). I will now discuss two aspects of open delivery; namely, open educational resources (OER) and open courses.

Open Educational Resources

In terms of open teaching, perhaps the most significant change in practice has been the explosion of repositories of freely available open educational resources (OER). Research on OER and initiatives in the field are discussed in Chapter 12; here I want to concentrate on what they mean for teaching practice and to describe some examples of how they are being used.

There is now a critical mass of high-quality OER repositories, some of the most significant of these are discussed in the next chapter. The vision behind the OER movement is to make educational resources freely available for use by learners and as inspiration for teachers to repurpose. There are three main perceived benefits of OER. Firstly, OER can provide examples of good practices to give practitioners good ideas of the types of learning interventions they might design for their teaching context. Secondly, practitioners can take and adapt existing OER. Thirdly, OER can act as mediating artefacts[6] that practitioners can then discuss with peers.

Open Courses

Moving beyond the provision of freely available resources, in recent years, a number of open, free online courses have emerged; for example, Siemens and Downes developed and delivered a twelve-week online course on connectivism, called 'Connectivism and Connective Knowledge'.[7] Not only were the tools and resources they used in the course free but also the expertise. They describe the course as a MOOC (massive open online course). The content, delivery and support for the course were totally free and anyone could join. An impressive 2,400 joined the

[6] This term is discussed in more detail in Chap. 5.

[7] http://ltc.umanitoba.ca/connectivism/?p=189

course, although ultimately the number of active participants was only about 200. The course provides a nice example of an extension of the open movement, moving beyond the OER movement to providing a totally free course. Siemens (2008) reflected on the course as follows:

> Did we change the world? No. Not yet. But we (and I mean all course participants, not just Stephen and I) managed to explore what is possible online. People self-organized in their preferred spaces. They etched away at the hallowed plaque of 'what it means to be an expert'. They learned in transparent environments, and in the process, became teachers to others. Those that observed (or lurked as is the more common term), hopefully found value in the course as well. Perhaps life circumstances, personal schedule, motivation for participating, confidence, familiarity with the online environment, or numerous other factors, impacted their ability to contribute. While we can't 'measure them' the way I've tried to do with blog and moodle participants, their continued subscription to The Daily and the comments encountered in F2F conferences suggest they also found some value in the course.

In an evaluation of the course, Fini (2009) found that the course attracted mainly adult, informal learners, who were unconcerned about course completion. Not surprisingly, a lack of time was cited as the main reason for non-completion. Time constraints, language barriers and information and communications technologies (ICT) skills affected the participants' choice of tools. For example, learners favoured the passive, filtered mailing list over interactive but time-consuming discussion forums and blogs. In addition, arguably, there is an issue with these MOOCs in terms of navigation. Learners can become confused by the sheer quantity of information and the variety of communication channels possible with these courses. No single learner pathway is provided.

Wiley developed and delivered a similar course, entitled 'Introduction to Open Education'.[8] The course aimed to provide the students with an overview of the field of open education and related topics such as copyright, licensing and sustainability. Students were asked to think, write and debate current practices and possible alternatives to open education. It was also free and offered to anyone; the only requirement was that students needed to keep a blog and to publish weekly posts on the various course topics. Students could attend the course in a number of ways: (1) credit based—students who needed credit had to sign up for an independent study at their university and find a supervisor to whom the instructor would send a grade at the end of the course; (2) non-credit based—students could attend the course without any grading from the instructor, and if they completed it, they get a certificate; and (3) informal—fully non-credit attendance of the activities.

Fini et al. (2008) derived a number of insights about how learners engaged with the course. Whilst the initial didactic structure promoted individual learning through reading and reflection, during course delivery peer learning occurred and participants were encouraged to take more active control of the course design and activities. The instructor then revised the course based on student observations and the learning materials they produced.

[8] http://www.opencontent.org/wiki/index.php?title=Intro_Open_Ed_Syllabus

Wiley describes the philosophy underpinning the design of the course (Wiley 2008). He suggests that the course is a mix of direct skills instruction, combined with project-based learning and collaborative problem solving. The course introduces progressively complex problems with supportive information and requires the learners to synthesise relevant literature, interview data and their own design intuition to produce meaningful artefacts both individually and as part of collaborative teams. He reflected that the course became more open over time. He listed the following as the key components of the course:

- Running everything in the open using an open wiki as the core delivery method and encouraging learner contribution to the core learning outcomes, reading lists, educational materials, etc.
- Using open blogs as the core writing outlet for weekly writing and encouraging broad community engagement in the writing, discussion and feedback processes
- Only using readings or other course materials that are freely available on the public Internet
- Accepting class members regardless of location or their admission status
- Offering multiple paths to credit through, for example:
  - Normal channels for students at his university
  - Backchannels for students at other universities, that is, students could sign up for an independent study at their home university with a faculty member who agreed to accept the course grade Wiley awarded at end of term—so students took the open course but received credit at their home university
  - A certificate of completion which did not have any university credit attached

Open Evaluation

As part of the xDelia project,[9] we have developed a design and evaluation framework (Clough et al. 2010). xDelia is using serious games and sensor technologies to facilitate emotional regulation in traders and investors. A detailed learning intervention has been designed and represented using the OU Learning Design Initiative (OULDI) design representations; this is described in Chapter 8. This provides a good example of adopting an open design approach to the development of a learning intervention. However, the project is also a good example of an open evaluation through the development and use of the xDelia design and evaluation framework. The framework is designed to provide an ongoing, critical reflective lens on project activities and aims to support interdisciplinary approaches to research (Fig. 11.2).

[9] http://xdelia.org

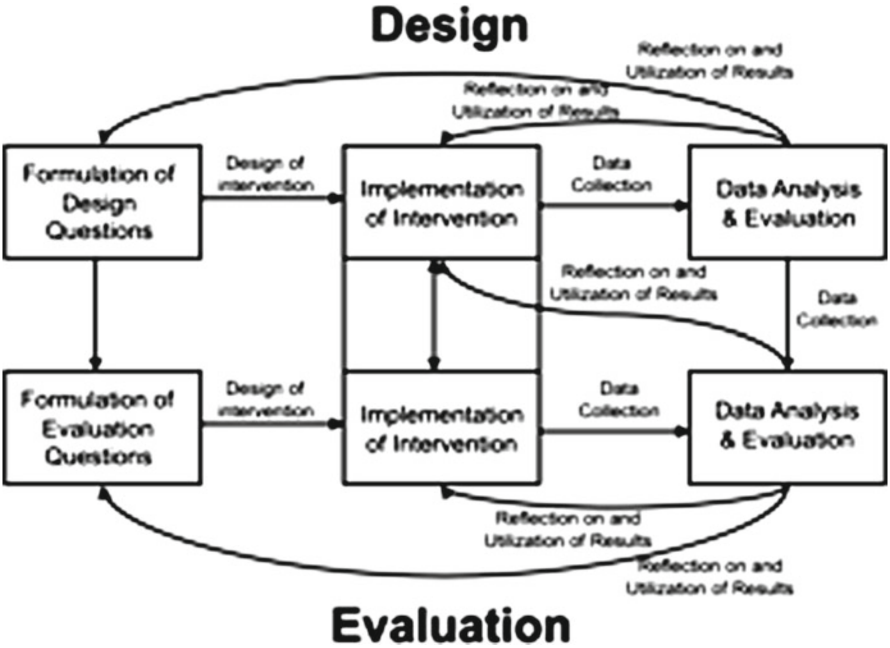


Fig. 11.2 The design and evaluation framework

The design and evaluation framework consists of two layers—a design layer and an evaluation layer. The design layer represents the research questions, interventions and analysis from the perspective of the research activity, for example, a workshop to brainstorm about methods of the potential research interventions that might be developed as part of the project. The evaluation layer represents these same aspects from the evaluative perspective. An evaluation layer intervention might include a video of the workshop activities, interviews with the participations, pre- and post-questionnaires and debriefing sessions. Both design and evaluation activities formulate their research questions in the left-hand side box, with the evaluation research questions guided, to some extent, by those of the design layer. The intervention is then implemented in the central box. Data is collected and analysed and the analysis then feeds back into the interventions and research questions. The design and evaluation framework represents an iterative process, in which the evaluation findings feed back into the project over time.

Digital Scholarship

New technologies have tremendous potential in terms of supporting more open digital scholarship practices. Borgeman argues that the Internet can facilitate distributed, data- and information-intensive collaborative research (Borgeman 2007a, b). Researchers now have access to literature in their field, a growing body of research data, and sophisticated research tools and services. They can collaborate with others around the world. Social and participatory media offer new mechanisms for researchers to communicate and disseminate their research and to engage in peer review and reflection. Borgeman argues that communication is the essence of scholarship, which is inherently a social activity, involving a wide range of public and private interactions within a research community (Borgeman 2007a, b). She argues that publication is part of a continuous cycle of reading, writing, discussing, searching, investigating, presenting, submitting and reviewing research. Using today's technologies researchers can communicate in a variety of ways with others and at a much larger scale than was possible before.

Weller refers to Boyer's definition of scholarship (Boyer 1990) in terms of discovery (i.e. the creation of new knowledge), integration (i.e. creating knowledge across disciplines), application (i.e. engagement with the wider community beyond education) and teaching (i.e. applying research to teaching). He lists three characteristics of digital scholarship: (1) openness and sharing as a default, (2) digital and (3) networked, a global network of peers to generate and share ideas (Weller 2011). He considers what these means for digital scholarship. He argues that new technologies mean we can do things differently. He cites the way in which Twitter, for example, can enable researchers to have access to immediate expertise on a global scale.

Pearce et al. (2010) argue that the concept of openness is synergistic with the use of new technologies. They cite Anderson (2009) and Burton (2009), who suggest that as a result of new technologies the notion of the 'open scholar' has emerged. In terms of discovery, they argue that new technologies offer new ways of generating, analysing and discussing research data. In terms of integration, there is a tension between the fast, open access mechanism now possible for publishing research outputs with the traditional publication vehicles of journals and books. There are a number of issues with the latter: the long lag times between submission and publication, increasing subscription costs and a growing resentment amongst academics in terms of them sending their own writing to the publishers for free and then having to buy them back—also in terms of free reviewing and editing. New technology-mediated dissemination channels offer powerful opportunities for researchers to convey their ideas to a wider audience through, for example, blogs, Twitter, YouTube and SlideShare. Finally, Pearce et al. (2010) consider teaching and in particular open education, which is where they argue we are seeing the biggest impact of new technologies and open approaches. They argue that the digitisation of learning and teaching resources means that they can easily be reproduced and shared on a global scale. They cite initiatives such as MIT's OpenCourseWare project[10] and the Open University's OpenLearn[11] repositories as examples. They conclude by reflecting on the ways in which technologies are changing practice and in particular scholarship:

> It is clear from the foregoing discussion that new technologies hold out very real possibilities for change across all facets of scholarship. In each case these afford the possibility for

[10] http://ocw.mit.edu/index.htm

[11] http://openlearn.open.ac.uk

new more open ways of working. Academic work has always contained a significant element of collaboration within academia but now it is increasingly easy to collaborate with more colleagues within but also beyond the academy and for the varied products of these collaborations to be available to the widest possible audience.

Open Research

The open access movement[12] is similar to the open educational resource movement. It aims to make research findings and publications freely available. This gives rise to a number of questions in terms of what the impact of adopting more open research practices will be, such as: What will be the impact of the open access movement for learning, teaching and research? How can we capitalise on the rich research data, which is now being made available on a global scale? Four examples are described: iSpot, eBank, EPrints and the use of social networking tools.

iSpot

A good example of harnessing the distributed collective intelligence of the network is the work being done as part of the iSpot project[13] on promoting scientific awareness. It is an online site where users can share and discuss sightings of fauna and flora around the UK (Fig. 11.3) (Clow and Makriyannis 2011).

The site is an excellent example of collective intelligence (Lévy 1997) and harnessing the power of the masses, as it enables the capture of sightings of flora and fauna from around the country on changes in patterns of nature that can then feed into ongoing research activities. Once registered, a user can add an observation to the website, suggest an identification or see if anyone else can identify the species. Users can also contribute to existing observations and there is a forum to stimulate debate. Despite the overall look and feel of the site being focussed on 'fun', it feeds directly into real research activities and also enables users to transfer their informal learning/interests into more formal educational offerings if they wish. Evaluation of the use of the site indicates that it is increasing general interest in science and is also resulting in users then signing up for more formal courses (Clow and Makriyanni 2011). The data collected on the site is being used by scientists and is providing them with a rich understanding of the changing ecology across the UK. It is a good example of the power of collective intelligence (Lévy 1997) discussed elsewhere in this book.

[12] See http://www.earlham.edu/~peters/fos/guide.htm for a guide to the Open Access Movement

[13] http://ispot.org.uk

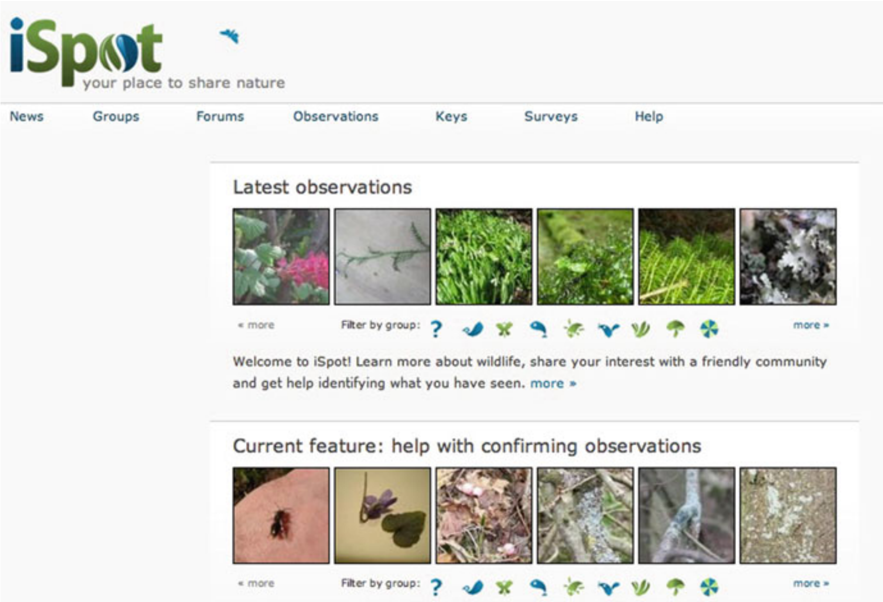


Fig. 11.3 Screenshot of the iSpot homepage

Galaxy Zoo[14] is a similar initiative. The general public are invited to help astronomy researchers to categorise and chart the galaxy using thousands of images derived from the Hubble Space Telescope Archive.

eBank

The eBank project[15] is a good example of adopting more open practices both in research and teaching. The aims of eBank were threefold: (1) to make data available through open access, (2) to link data to references and (3) to make research data available and applied in the learning context. The evaluation of the project (Conole 2006) indicated that there was a need to articulate the benefits of this approach (i.e. open access to research data) both to individual researchers (so that they could disseminate their research findings more quickly) and to the wider research community.

Lyon (2003) outlined a number of benefits of making data openly available, including providing direct access to data, linking data to research publications, providing a mechanism for ensuring robustness, openness and provenance in the

[14] http://www.galaxyzoo.org/

[15] http://www.ukoln.ac.uk/projects/ebank-uk/

academic process and enabling more rapid dissemination of scientific ideas. For learning and teaching, she saw a benefit in terms of:

> …enriching the student experience, this approach [i.e. it provides students with access to original data and linking data to research references] would help to develop their evaluation and critical skills, because they would be able to go back and look at the conclusions a researcher had derived from a set of data and they could analyse it themselves and think did they [the researcher] make the right decisions, how would I have done it, was the method correct, those sorts of things, so that was the pedagogical benefits I could see? [Int 10] (Conole 2006)[16]

Traditionally, research outputs have taken the form of 'polished', peer-reviewed, published data (often in the form of static, journal articles). eBank opened up the possibility of making 'raw' research data available—either for individual use, within a shared research workspace or more widely across the research and teaching communities. One of the key points, stressed by those involved in the project, was that this was about making data easy to find and easily available, enabling researchers to think of different ways in which they might then use the data. However, having data open and more accessible does potentially change its perceived value or worth. It also raises questions about an individual researcher's 'moral obligation' in terms of making their research information available and shareable across the research community. Indeed, the university sector fundamentally differs, it could be argued, from other business sectors, in that its primary 'product' is the research and teaching outputs of individuals, their intellectual capital, rather than any tangible, physical product. This view of 'information' and intellectual outputs and its worth is an inherent characteristic of universities (both in terms of research and teaching) and is fundamentally different from the perspective of those in other sectors—such as commerce (Oliver et al. 2007). It is unclear yet what the impact might be of making such intellectual capital more explicitly available in terms of its perceived value and worth.

A feature to emerge from the evaluation of eBank was the importance of the conceptual models underpinning eBank and how these models helped articulate and shape the project vision. What was also evident is that development and in particular clear articulation of such models requires time—to develop and refine the language used, establish the models and to think about how they can be applied. A number of models were evident (Fig. 11.4).

Firstly, there is the scholarly knowledge life cycle model (Lyon 2003). Secondly, there is a model around the notion of providing the link from the data through to publication and vice versa. Thirdly, there is a nascent model about articulating a set of pedagogical approaches, which might be applied to capitalise on the potential of this approach. More difficult to articulate, but also evidently important, is the issue about shared language and the evolution of definitions as the consortium worked towards developing some shared understanding. These concepts—'scholarly knowledge

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[16] The evaluation included interviews with members of the eBank team; quotes here are taken from that evaluation (Conole 2006).

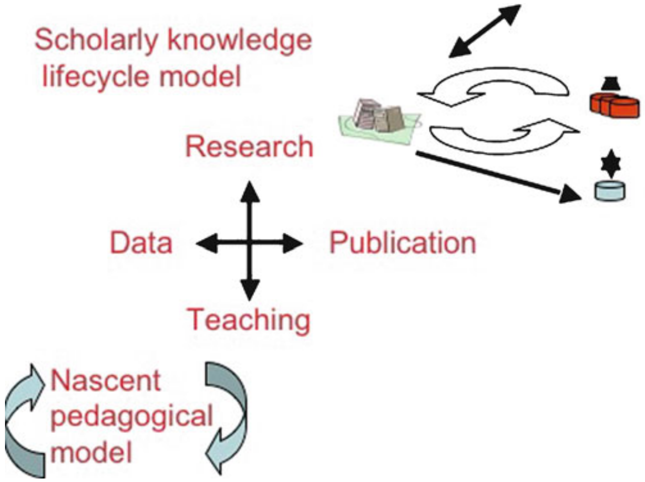

Fig. 11.4 Inherent models underpinning eBank (Adapted from Lyon 2003)

cycle' (as a means of describing the process) and 'data as collections' (as a means of describing a particular aspect of or property of data)—can be viewed as examples of how the researchers were attempting to articulate and make sense of the problem space they were working in.

One of the three aspirations underpinning eBank was to explore how making research data electronically accessible and linked to published references could be utilised in a teaching context. To explore this, the consortium trialled the use of eBank material in the MChem course at the University of Southampton, within the final year module on chemical informatics (Chem 6016). Typical activities used in the course included searching the eBank database for molecules and then getting the students to make links with the Cambridge Crystallographic Data Centre.[17] A key pedagogical aspiration of the module was to get students to understand and manipulate chemical research data. The module was designed so that students had ample opportunities to work collaboratively in workshops, but they also had the opportunity to work through problems individually. It was an optional module, running in the second semester until the last week of May. The course was accompanied by a Learning Management Systems (LMS) Blackboard site, which contained course material and was used for course administration and dissemination. All the students had previously completed a 6-month work placement in industry. The face-to-face components of the course ran on Tuesdays and Wednesdays. During 2005–2006, the course had 15 students registered. In the previous year, it was also made available as an option for third-year students, which increased the numbers taking the course. Some postgraduates also did the course (all postgraduates need to get 120 credits during the first year of their PhD, which is the equivalent of 4 units). The

[17] http://www.ccdc.cam.ac.uk/

course was designed so that there was a progressive building up of complexity and use of real and authentic data, clearly linked to and of relevance to work-based learning, which was timely as these students had just completed their 6-month work placement.

In terms of the application of the ideas in eBank for teaching and learning purposes, there did not appear to be an explicit pedagogical model, although those interviewed did have some specific ideas of how the outputs from eBank might be used for teaching. The development of new pedagogical models, which harness the potential of technologies, is notoriously difficult, and work in this area is still in its infancy (see Conole (2010) for a critique of existing pedagogical models and their impact); however, without a clear explicit pedagogical model, it is difficult to guide teachers in designing new activities which make use of technical innovations. A book does not encourage problem-based or reflective learning; it is about how this is used within a structured learning activity that enables these approaches to be adopted. Similarly, the outputs from eBank in isolation are of little use for teaching purposes unless they are applied within a clear pedagogical model to achieve specific learning outcomes. There is a nascent pedagogical model implicit in the scholarly cycle; what is needed is to turn this into an explicit model which can be used in teaching. The development of specific learning scenarios or pedagogical patterns (Goodyear 2005; Goodyear and Retalis 2010) built around the use of eBank data might be the basis for developing a pedagogical model.

Furthermore, what would ‘count’ as an innovative pedagogical model in this respect? For the crystallography students, access to material electronically is not innovative (they are used to and constantly exposed to a myriad of electronic data to support their studies). To innovate, the pedagogical model would need to draw out the new learning opportunities. Access to data in this format might provide, ways in which it might enable the students to do things such as interrogate and manipulate the data in ways that they have not been able to before.

However, it is worth noting that other areas of chemistry and other science disciplines are generally not so technically literate as the crystallographers, and hence, providing access to data electronically in a teaching context would be valuable. There is therefore a balance between the degree of readiness of a discipline to take ideas forward and apply them versus the level of technical expertise—if they are already using technology extensively, it will take more to demonstrate innovation.

EPrints

In the 1990s, Steven Harnard lead the development of the open access movement, aimed at making academic outputs freely available (Harnard and Hey 1995; Hey 1997, 2004). The University of Southampton developed the EPrints software,[18] as a vehicle for creating open access archives of research output. Since then, more and

[18] http://www.eprints.org/

more institutions have set up similar repositories, and these are now recognised as important mechanisms for valuing and showcasing institutions' intellectual assets. Reflecting on the evaluation of the implementation and uptake of EPrints at Southampton University, Hey (2004) concludes that:

> To achieve a sustainable repository we need to integrate our archive within the natural processes of its staff and students; this gives them the bonus of a reusable resource. While immediate visibility leading to increased research impact is the primary aim of Stevan Harnard's campaigns, we can achieve this by example, practice and cooperation.

Social and participatory media enable researchers to share and discuss their research findings within their peer community, and arguably, we are seeing a change in research practice as these mechanisms become increasingly important. It is unlikely that publication of research in these spaces will supplant traditional publication mechanisms such as journals and books; however, it is likely that they will become increasingly important and sit alongside these. There may well come a point when it is almost a requirement that research outputs are available digitally.

Exploiting Social Networking Tools

Finally, academics are increasingly using blogs and microblogging sites, such as Twitter, to communicate their ideas and to interact with peers. Many academics now keep blogs and use them as a way of disseminating their latest research ideas. Conole (2007) argues that blogging sits alongside and complements other forms of communication, namely, academic papers and conferences, and suggests the following as functions for these:

- Academic papers: reporting of findings against a particular narrative, grounded in the literature and related work; style—formal, academic-speak
- Conference presentations: awareness raising of the work, posing questions and issues about the work, style—entertaining, visual, informal
- Blogging: snippets of the work, reflecting on particular issues, style—short, informal, reflective

She goes on to argue that academic discourse is a mix of all three forms of communication. I would add to these Twitter as an additional mechanism for disseminating information and for communicating with peers. For many in educational technology, Twitter has become an important part of their personal digital environment, providing just-in-time access to resources and expertise. For example, in researching background material for this chapter, I tweeted the following:

> gconole: Looking 4 gd examples of openness and open practices 4 my chapter any examples? will include learning design, CCK09, OER, digital scholarship

and here are some of the replies I got within minutes:

> manmalik: @gconole use of twitter by proj students is open and invites comments from their community on what they are working on: resources, ideas
> mpaskevi: @gconole Example of openness through OER leading to an opportunity to publish. http://bit.ly/hdJ04G

dombles: @gconole TESSA? Open2.net?

AJCann: @gconole Google open chemistry and chemwiki

misetak: @gconole Materials online or meetings online? http://edtechroundup.wikispaces.com/

This demonstrates the power of these tools and how they can be used to support distributed, open research practices.

Other social networking sites are also being used increasingly by researchers. These include generic tools such as Facebook, ELGG and Ning, as well as more specialised sites such as Academia.edu[19] and Cloudworks (which is discussed in Chapter 15). For example, on Facebook, it is possible to set up or join specialised group pages, and indeed, there are now a range of specialised group pages on different educational topics. A recent addition to the suite of social networking tools that academics can use is GooglePlus,[20] which has a number of interesting features such as the notion of different circles of friends, hang outs (video conferencing) and the ability to have both individual and group chats. It is unclear at the time of writing what the impact of GooglePlus will be and to what extent it will replace more established tools like Facebook and Twitter.

Conclusion

This chapter has discussed the notion of openness and associated open practices. It has considered how technologies can be used to enable more open practices across learning, teaching and research. It has argued that we are seeing a fundamental change in practice. It has considered in particular four categories of openness: open design, open delivery, open evaluation and open research. It discussed the tensions between these open practices and more traditional mechanisms for engaging in academic discourse. The range of social and participatory media which are now available are resulting in a shift in the way learning, teaching and research is being conducted. They are also challenging existing practices and institutional structures and processes. Higher education institutions need to reposition themselves and develop new business models in a context where free resources, expertise and whole courses are now becoming more common place. Similarly, traditional publishing houses no longer have a monopoly on research outputs and hence need to increasingly take account of the alternative open publishing mechanisms that researchers are now beginning to use.

[19] http://academia.edu/

[20] https://plus.google.com/

References

Anderson, P. (2007, February). What is Web 2.0? Ideas, technologies and implications for education. Citesser, JISC Technology. Standards watch. Available online at http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf. Accessed 11 Aug 2011.

Anderson, T. (2009, September 8–10). ALT-C Keynote Presentation, ALT-C conference, Manchester. Available online at http://www.slideshare.net/terrya/terry-anderson-alt-c-final

Bartolomé, A. (2008). *Web 2.0 and new learning paradigms*. Retrieved from http://www.elearningeuropa.info/out/?doc_id=14603andrsr_id=15529. Accessed 21 Sept 2011.

Bates, T. (2005). *Technology, e-learning and distance education*. London: RoutledgeFalmer.

Bean, M. (2010, January 25). Achieving volume in online learning, presentation to the HE e-learning task force, London.

Bean, M., & Yeo, J. (2010). *A background paper from the Open University*. Paper for the HEFCE online e-learning task force. Milton Keynes: The Open University.

Borgeman, C. (2007a). *The continuity of scholarly communication scholarship in the digital age: Information, infrastructure and the Internet*. Hong Kong: SNP Best-set Typersetter Ltd.

Borgeman, C. (2007b). *Scholarship in the digital age: Information, infrastructure and the Internet*. Hong Kong: SNP Best-set Typesetter Ltd.

Boyer, E. L. (1990). *Scholarship reconsidered: Priorities of the professoriate*. Princeton: Carnegie Foundation.

Burton, G. (2009). *The open scholar. Academic Evolution*. Retrieved from http://www.academicevolution.com/2009/08/the-open-scholar.html. Accessed 21 Sept 2011.

Carson, S. (2010). Failure to define success. http://tofp.wordpress.com/2010/11/04/failure-to-define-success/

Clough, G., Conole, G., & Scanlon, E. (2010, May 3–4). *Using participatory evaluation to support collaboration in an inter-disciplinary context*. Networked Learning Conference, Aalborg, Denmark.

Clow, D., & Makriyannis, E. (2011). *iSpot analysed: Participatory learning and reputati*. 1st Learning analytics and knowledge conference, 28th February–1st March 2011, Banff, Alberta, Canada.

Cobo, C., & Pardo, H. (2007). *Planeta web 2.0 inteligencia colectiva o medios fast food*, Grup de Recerca d'interacctions. Digitals, Universitad de Vic. Flacso México. Barcelona//México, DF.

Conole, G. (2006). *External evaluation of the eBank project*. Southampton: University of Southampton.

Conole, G. (2007, October 20). The nature of academic discourse, e4innovation blog post, http://e4innovation.com/?p=45. Accessed 7 Oct 2011.

Conole, G. (2010). *Review of pedagogical models and frameworks*. Report for the HEFCE e-learning task force. Available online http://cloudworks.ac.uk/index.php/cloud/view/2982

Fini, A. (2009). Technological dimensions of a Massive Open Online Course: The case of the CCK08 course tools, IRRODL, 10, 5. Available online at http://www.irrodl.org/index.php/irrodl/article/viewArticle/643. Accessed 7 Oct 2011.

Fini, A., Formiconi, A., Giorni, Pirruccello, N. S., Spadavecchia, E., & Zibordi, E. (2008). *Open education and virtual communities: An experience*. In proceedings of the Conference Knowledge Construction in E-learning Context: CSCL, ODL, ICT and SNA in education CEUR-WS.org.

Freire, J. (2008). Universities and Web 2.0 institutional challenges. Retrieved from http://www.elearningeuropa.info/out/?doc_id=14604andrsr_id=15530. Accessed 7 Oct 2011.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology, 21*(1), 82–101.

Goodyear, P., & Retalis, S. (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers.

Harnard, S., & Hey, J. (1995). *Esoteric knowledge, the scholar and scholarly publishing on the net*. London: Library Association Publishing.

Harnard, S., Brody, T., Vallieres, F., Carr, L., Hitchcock, S., Gingras, Y., Oppenheim, C., Stamerjohanns, H., & Hilf, E. (2004). The access/impact problem and the green and gold roads to open access. *Serials Review, 30*(4), 310–314.

Hey, J. (1997). E-Journals for research: The user perspective. *Serials, 10*(1), 65–68.
Hey, J. (2004). Targeting academic research with Southampton's institutional repository. *Ariadne*, 40.
Katz, R. (2008). The tower and the cloud: Higher Education in the age of cloud computing, an Educause ebook. Available to download from http://www.educause.edu/thetowerandthecloud. Accessed 7 Oct 2011.
Lévy, P. (1997). Collective intelligence: Mankind's emerging world in cyberspace (R. Bononno Trans.). Cambridge, MA: Perseus Books.
Lyon, L. (2003). *eBank UK: Building the links between research data, scholarly communication and learning*, *Aridane*, 36. Available online at http://www.ariadne.ac.uk/issue36/lyon/. Accessed 20 Nov 2006.
McAndrew, P., & Weller, M. (2005). Applying learning design to supported open learning. In R. Koper & C. Tattersall (Eds.), *Learning design – A handbook on modelling and delivering networked education*. Berlin: Springer.
McAndrew, P., Scanlon, E., & Clow, D. (2010). An open future for higher education. *Educause quarterly report*, *33*(1). Available online at http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/AnOpenFutureforHigherEducation/199388. Accessed 7 Oct 2011.
Newbould, D. (2010). Comment on draft chapter. From http://www.slideshare.net/grainne/chapter-16-open-practices. Accessed 7 Oct 2011.
O'Reilly, T. (2004, 2011, January 17). The architecture of participation. Available online at http://www.oreillynet.com/pub/a/oreilly/tim/articles/architecture_of_participation.html. Accessed 11 Aug 2011.
Oliver, M., Roberts, G., Beetham, H., Ingraham, B., Dyke, M., & Levy, P. (2007). Knowledge, society and perspectives on learning technology. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives on e-learning research*. London: RoutledgeFalmer.
Pearce, N., Weller, M., Scanlon, E., & Kinsley, S. (2010). Digital scholarship considered: How new technologies could transform academic practice. *Education*, *16*(1). Available online at http://ineducation.ca/article/digital-scholarship-considered-how-new-technologies-could-transform-academic-work. Accessed 7 Oct 2011.
Rumble, G. (1989). 'Open learning', 'distance learning', and the misuse of language. *Open Learning: The Journal of Open, Distance and e-Learning, 4*(2), 28–36.
Sharpe, R., Beetham, H., & Freitas, D. (2010). *Rethinking learning for the digital age: How learners shape their own experiences*. London: Routledge.
Siemens, G. (2008, November 24). Who is still participating?, blog post. Available online at http://ltc.umanitoba.ca/connectivism/?p=182. Accessed 7 Oct 2011.
Siemens, G. (2009, August 11). Connectivism and connective knowledge 2009. Available online at http://ltc.umanitoba.ca/connectivism/?p=189. Accessed 7 Oct 2011.
Straub, R. (2008, April). *Is the world open? Global focus, volume 2, issue 1 (2008),* European Foundation for Management Development, Elearning papers. Available online at http://elearningpapers.eu/en/article/Is-the-world-open%3F
Tait, A. (2003). Reflections on student support in open and distance learning, Guest Editorial. *International Review of Research in Open and Distance Learning*, *4*(1).
Tait, A., & Mills, R. (2003). *Rethinking learner support in distance education: Change and continuity in an international context*. London: Routledge.
Weller, M. (2007). The distance from isolation. Why communities are the logical conclusion in e-learning. *Computers and Education, 49*, 148–159.
Weller, M. (2009). Reflections on openness. http://nogoodreason.typepad.co.uk/no_good_reason/2009/09/reflections-on-openness.html. Accessed 7 Oct 2011.
Weller, M. (2011). *Digital, networked and open*. London: Bloomsbury Academics.
Wiley, D. (2008, July 18). The "Wiley WIKI design", Opencontent blog posting. Available online at http://opencontent.org/blog/archives/514. Accessed 7 Oct 2011.
Wiley, D. (2010). Why bother being open? http://opencontent.org/blog/archives/1735. Accessed 7 Oct 2011.
Wiley, D. (n.d.). E-learning and openness. Retrieved from mediastudio.unu.edu/download/wiley.ppt. Accessed 7 Oct 2011.

Chapter 12
Open Educational Resources

Introduction

There has been a growing interest in recent years in making educational content freely available. Terms such as 'open content' and 'open educational resources' (OER) have gained currency, and there is now a well-established international community of those interested in producing, using and researching OER. This chapter is not intended to provide a comprehensive review of the field but simply to summarise some of the issues and highlight key references.

The Open Educational Resource Movement

Iiyoshi and Kumar (2008), through an edited collection, consider the wider notion of 'openness' and what it might mean in an educational context, in terms of open content, open technology and open knowledge. They argue that this is beginning to change the way educators use, share and improve educational resources and knowledge by making them freely available. They suggest that the central tenet of open education is that 'education can be improved by making educational assets visible and accessible and by harnessing the collective wisdom of a community of practice and reflection'. Oblinger and Lombardi argue that 'due to changes in technology, a participatory culture is emerging with a new openness to sharing, collaboration, and learning by doing' (Oblinger and Lombardi 2008, p. 398).

The term open educational resources (OER) was first used by UNESCO at its 'Forum on the Impact of Open Courseware for Higher Education in Developing Countries' in 2002. However, it is worth noting that MIT had already used the term

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_12,

OpenCourseWare in 2001.[1] Alternative labels include 'open courseware', 'open learning resources' and 'open teaching/learning resources' (UNESCO 2002). The Hewlett Foundation defines OER[2] as:

> Teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others.

Whilst OECD defines them as:

> Digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research. (OECD 2007, p. 133)

Commissioned by the Hewlett Foundation, Atkins et al. (2007) provide a comprehensive review of the development of the OER movement, describing many of the major initiatives in the fields and some of the key achievements. A complementary report emerged at around the same time, commissioned by OECD (2007). Both reports give a good overview of the field, the motivations and aspirations behind the OER movement, as well as a reflection on some of the challenges associated with this area.

According to OECD (2007), at the time of writing, there were over 300 universities worldwide engaged in the development of OER with more than 3,000 open access courses; examples include the following:

- OpenCourseWare Consortium[3]
- China Open Resources for Education (CORE) consortium[4]
- Japanese OCW Consortium[5]
- ParisTech OCW project[6]
- Irish IREL-Open initiative[7]
- Jorum repository[8]

The scale of effort and investment in the development of OER is impressive, as the following statement on the OpenCourseWare website[9] indicates:

> OpenCourseWare Consortium is a collaboration of more than 200 higher education institutions and associated organizations from around the world creating a broad and deep body of open educational content using a shared mode.

[1] http://ocw.mit.edu/index.htm

[2] Definition on the Hewlett Website, http://www.hewlett.org/Programs/Education/OER/

[3] http://www.ocwconsortium.org/

[4] http://www.core.org.cn/cn/jpkc/index_en.html

[5] http://www.jocw.jp/

[6] http://graduateschool.paristech.org/

[7] http://www.irel-open.ie/

[8] http://www.jorum.ac.uk/

[9] http://www.ocwconsortium.org/about-us/about-us.html

In 2002, Hewlett initiated an extensive OER programme, the chief aim was to 'catalyze universal access to and use of high-quality academic content on a global scale' (Atkins et al. 2007, p. 1). More recently, in the UK, the Higher Education Academy (HEA) and the Joint Information Systems Committee (JISC) have initiated a large-scale call on the development of OER,[10] building on existing initiatives such as Jorum[11] and OpenLearn.[12]

The Cape Town Open Education Declaration[13] argues that the OER movement is based on:

> The belief that everyone should have the freedom to use, customize, improve and redistribute educational resources without constraint.

It focuses on three suggested strategies to removing barriers to the use of OER: teacher and learner engagement with OER, a general policy to publish openly and commitment to open approaches at institutional and government levels.

The OER movement has been successful in promoting the idea that knowledge is a public good, expanding the aspirations of organisations and individuals to publish OER. However, as yet the potential of OER to transform practice has not being realised, there is a need for innovative forms of support on the creation and evaluation of OER, as well as an evolving empirical evidence base about the effectiveness of OER. However, recognition of the importance of investment and effort into promotion of the use and uptake of OER is evident in the prominence given to OER developments in a major report on cyberlearning, commissioned by the National Science Foundation (Borgeman et al. 2008). Interestingly, 'adopt programs and policies to promote open educational resources' is one of the five higher-level recommendations in the conclusion to the report.

Researching open educational resources raises issues around how to address global connections, reuse, design and evaluation of worldwide efforts to work with learning resources that are available for free use and alteration. This statement is evident in the following quote on OER from OECD:

> OER is not only a fascinating technological development and potentially a major educational tool. It accelerates the blurring of formal and informal learning, and of educational and broader cultural activities. It raises basic philosophical issues to do with the nature of ownership, with the validation of knowledge and with concepts such as altruism and collective goods. It reaches into issues of property and its distribution across the globe. It offers the prospect of a radically new approach to the sharing of knowledge, at a time when effective use of knowledge is seen more and more as the key to economic success, for both individuals and nations. How paradoxical this may turn out to be, and the form it will eventually take are entirely unforeseeable. The report offers some preliminary handles for understanding the issues raised. (OECD 2007, p. 9)

[10] See http://www.jisc.ac.uk/fundingopportunities/funding_calls/2008/12/grant1408.aspx for details of the call and associated documentation

[11] http://www.jorum.ac.uk/

[12] http://www.open.ac.uk/Openlearn/

[13] http://www.capetowndeclaration.org/

Open provision of course materials has become an extended movement with many universities now adopting the approach. Although there are indications of the adoption of new open approaches, the diverse OER projects have not received much research attention to establish how best to move from existing provision to better structures for open operation. UNESCO (2002) identified four elements that have to be considered when talking about open educational resources:

- The vision for the service: open access to resources, with provision for adaptation
- The method of provision: enabled by information and communication technologies
- The target group: a diverse community of users
- The purpose: to provide an educational, noncommercial resource (UNESCO 2002, p.24)

The main properties of OER are free access 'enabled by information and communication technologies' and a 'non-commercial purpose' (UNESCO 2002, p.24). OER are intended to make 'high-quality educational material freely available worldwide in many languages' (Keller and Mossink 2009).

McAndrew et al. (2009) argue that despite some terminological differences (see also Hylén 2006), open educational resources are largely digital assets (music, images, words, animations) put together into a logical structure by a course developer, who has attached an open licence to these. In other words, the content is openly available (i.e. it can readily be found or discovered), is openly accessible (i.e. it is in a form which others can take away) and openly reusable (i.e. the user can easily modify it and is allowed under the licence to do certain things with it without having to ask the creator's permission first).

A Review of OER Initiatives

This section will give an overview of the different OER initiatives and an indication of what they have focused on. This draws on desk research done as part of the Open Education Quality initiative[14] (OPAL) initiative's work to articulate dimensions associated with open educational resource practices. In order to abstract the practices around the design, use and management of OER, a review of international OER initiatives was undertaken. This is discussed in more detail in the next chapter. A number of criteria were used in choosing the case studies to be reviewed:

1. Well established. We included a significant number of OER initiatives that were well established, as we believed that these were likely to have a more mature set of associated practices and an understanding of the barriers and enablers associated with OER.
2. Coverage of key areas. Examples that provided evidence alongside the key areas of interest (policy, quality, innovation, barriers and enablers, etc.).

[14] http://oer-quality.org/

3. Geographical coverage. As much as possible a reasonable geographic spread, with a particular emphasis on examples from Europe.
4. Educational sectors. Examples, which were both from the field of higher education and from adult education.

A case study template was drawn up outlining the data to be collected. This included background and contextual information, as well as headings around the key areas of interest. The template was validated within the consortium. The case studies were then collated and analysed to draw out key features. An evolving set of OER dimensions was then derived (these are discussed in the next chapter). The scope of research covered both higher education (HE) and adult education (AE). Whereas HE refers to the traditional HE segments, inclusion of the AE sector widens this territory and includes both the further education sector and also post-degree and non-degree related provision. The higher education sector included European universities and HE institutions (private and public) offering educational programmes/courses for students, corporations, professional training, etc. The adult education sector included all forms of non-vocational adult learning, whether of a formal, non-formal or informal nature (taken from the glossary of terms of the Lifelong Learning programme)[15] This goes beyond university education and includes also community colleges, adult learning centres, providers for professional training and further education for adults. Adult education is also sponsored by corporations, labour unions and private institutions. Sixty case studies were collected and are available online.[16] This section will discuss a sample of these to give an indication of the different types of OER initiatives.

The case studies reviewed during the research are listed in the Appendix to this chapter by country/geographic region. Further details on each case study are available in the individual case study templates.[17] The case studies were chosen to give a spread in terms of covering both the HE and AE sectors, geographical local and representative of the different types of projects/initiatives possible (i.e. different types of consortium, different focus, spread of subject areas, models of quality assurance, etc.). Next, four of these initiatives will be described to give a flavour of the different nature of the initiatives.

Case Study 1: The OpenLearn Project

MIT was one of the first projects established to develop OER, attracting funding from the William and Flora Hewlett Foundation in 2000. The Open University in the UK successfully bid for support from the Hewlett Foundation to establish its

[15] http://ec.europa.eu/education/programmes/llp/glossary_en.html

[16] http://cloudworks.ac.uk/cloudscape/view/2085

[17] These are available online at http://cloudworks.ac.uk/cloudscape/view/2085

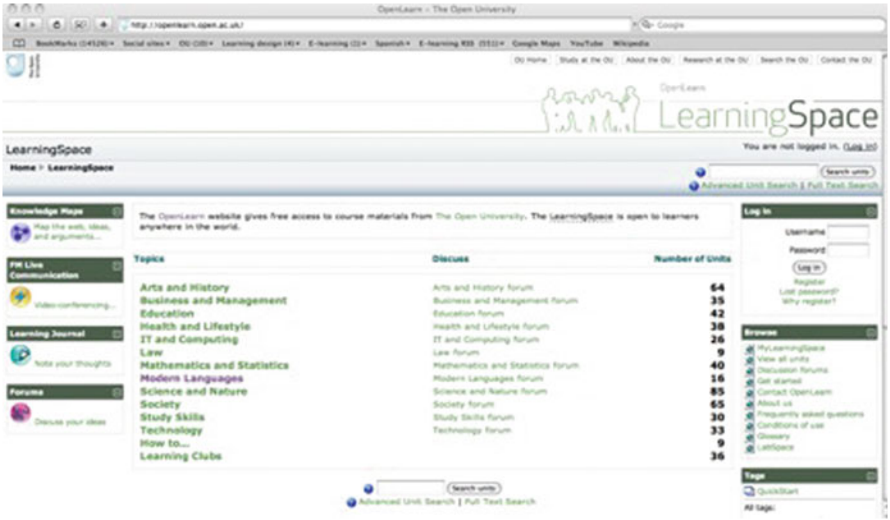

Fig. 12.1 LearningSpace in OpenLearn

open content initiative, launched as OpenLearn in 2006. OpenLearn[18] is an online repository of open educational resources, derived from existing OU course materials. The site aimed to make a significant proportion of the Open University UK's educational materials freely available on the Web.

The initial site was made publicly available in October 2006 and now offers a full range of Open University subject areas from access to postgraduate level, with over three million visitors since it was launched. The site is divided into two sides: LearningSpace (which provides access to the quality assured OER derived from Open University courses) and LabSpace (where users can download, repurpose and upload OER).

Figure 12.1 shows a screen shot of the site. In April 2008, OpenLearn reached its target of 5,400 learning hours (based on designed time for student activity) of content in the LearningSpace and 8,100 h in the LabSpace. The site was built using the open source learning environment Moodle.[19] In addition to the OER, the site provides a variety of learning support and social networking tools. These include forums linked to individual OER to connect and discuss with others, an instant messaging and presence indicating tool (MSG),[20] Compendium,[21] a shared argumentation tool for visualising and representing OER, FlashMeeting[22] for live video conferencing and a learning journal for users to reflect on and record their experience.

[18] http://Openlearn.open.ac.uk
[19] http://moodle.org/
[20] http://technologies.kmi.open.ac.uk/msg/
[21] http://compendium.open.ac.uk/institute/
[22] http://cnm.open.ac.uk/projects/flashmeeting/

Lane (2006) provides a commentary on the OpenLearn experience and in particular gives an overview of many of the issues involved in initially setting up and running OpenLearn. He sets out a conceptual framework describing what the project was intending to achieve and then lays down the steps needed to move from the necessity of a fairly constrained repurposing situation in the short term towards a more open and creative environment in the longer term.

McAndrew (2006) discusses the rationale behind the development of OpenLearn and in particular looked at how the initiative aligns with the practices associated with Web 2.0 technologies. He argues that OpenLearn—with its associated tools for communication and collaboration—provides a useful test bed to explore and research user behaviour in participating in new digital environments. This experimental aspect was identified as part of the rationale for OpenLearn, which meant that a range of research issues were picked up.

Lane (2006), McAndrew (2006) and others see that there is a need for a collective understanding of the impact of OER in terms of how they are changing learning and teaching practices. They argue that there is value in extrapolating the findings and lessons learnt from individual OER initiatives and that these can inform the overall research direction in the field. In the final research and evaluation report for the initiative, McAndrew et al. (2009) summarise the research findings from the evaluation of OpenLearn and reflect on the implications for future OER activities. An integrative approach was use for the evaluation; research activities included action research, direct and remote studies, trials and experiments, and surveys and interviews. The evaluation provided valuable insights into how users perceived the OpenLearn materials and more importantly how they were being used. Three main categories of users were identified based on their level of engagement with the site: enthusiasts, registered users and visitors.

Findings were both expected and surprising. Although the majority of users of the site welcomed the concept of free educational resources, the concept of OER was not always fully understood—many assumed there was an associated cost of some sort. A significant proportion said they would use the site again (there were over 100,000 unique visitors each month). Perhaps surprisingly, users classified material as interactive even when they were text based. Interest in downloading content was high, but evidence of reuse was low when measured in terms of content returned to the site. There appeared to be both technical (lack of understanding of XML[23]) and pedagogical (lack of experience of redesigning and not wanting to alter existing perceived 'good' content) barriers to reuse.

A need for a more explicit understanding of the inherent design associated with OER became evident; educators appeared wary of using content without first understanding it. In fact, research exploring the design of educational materials and activities was being undertaken in parallel to the OpenLearn project, and although this work considered design more broadly in terms of learning and teaching, it was evident that a lot of the tools, methods and approaches being developed could be

[23] http://www.xml.com/

adapted and applied specifically to an OER context. There was strong institutional support for the project, so OpenLearn is an example of a top-down driven initiative. In addition, it has a robust quality assurance mechanism in place for the creation and sharing of the resources. It shows evidence of innovative use of tools, both through the adaptation of the Moodle Learning Management System and the range of tools for visualising, sharing and discussing the OER described earlier.

Case Study 2: Wikiwijs

Wikiwijs[24] is an open, online platform of open educational resources. Teachers and learners can find, download, adapt and re-upload resources. It subscribes to open source principles and is based on open content and standards. As suggested by the name, the project is inspired by the notion of wikis as co-constructed collaborative content. The Ministry of Education in Holland commissioned OUNL and Kennisnet[25] to articulate a plan for the project around five aspects:

- The development of an adequate technical infrastructure
- The collection of sufficient educational resources
- The establishment of an enthusiastic community of teachers
- The development of proficient users, with the necessary skills to develop and use OER
- The development of a clearer understanding of the research issues

There were a number of clearly articulated policy objectives associated with Wikiwijs. Firstly, it aimed to stimulate the development and use of OER by extending the options for customising education and by increasing the quality of education through more flexible and up-to-date learning materials. Secondly, it aimed to improve access to both open and closed digital learning materials. Thirdly, it aimed to support teachers in arranging their own learning materials and professionalisation. Fourthly, it aimed to increase teacher involvement in the development and use of OER.

Case Study 3: LeMill

LeMill[26] is a Web-based community of teachers and other learning content creators for finding, authoring and sharing open educational resources. It has more than 8,000 reusable learning content resources, more than 4,000 descriptions of learning and teaching methods and almost 1,000 descriptions of teaching and learning tools.

[24] http://www.wikiwijs.nl/sector/

[25] http://www.kennisnet.nl/

[26] http://lemill.net/

There are also learning and teaching stories available. The LeMill community has members from 61 countries and content is available in 13 languages. It was designed and developed as part of European Commission's 6th Framework Programme project CALIBRATE.[27] Its aims were to support the collaborative use and exchange of learning resources in schools. It brought together 8 ministries of education, including 6 from new member states and involved 17 partners in all.

LeMill supports the idea of working in groups through the LeMill community. There are community blogs for interest groups to coordinate and discuss the group's work. All learning resources in LeMill are either labelled 'draft' or 'published'. Members can decide when the content will be published. The change from 'draft' to 'published' does not change anything in the availability of the content. The flag 'published' just tells users of the site that the author(s) have considered it to be ready. When content is public, its authors are shown. For draft resources the authors are not shown. People can continue to modify and improve the resource after publishing it.

If the user finds some content incorrect they can join LeMill and alter it. The guidelines ask users to respect other people's points of view and encourage them to provide 'deeper thought and reasons' behind the content they have created and made available on the site. LeMill trusts the community's self-evaluation; however, the maintainer of the service also tracks all the editing made to the site and can block vandals or report criminal activities.

In addition to content, methods and tools, the site includes learning and teaching stories. A story is a description of how some content, methods and tools have been used together in a single learning event, such as a study course. Stories loosely join the other resources together. From the stories, users get valuable hints on how the resources found from LeMill have been used in real learning and teaching contexts. Through stories they may share their own experiences or use them to plan their own teaching.

Case Study 4: Podcampus

Podcampus[28] is a podcasting platform for scientific and research contributions. Lectures and courses of interest are recorded and published as audio and video files. Some items have been produced exclusively for Podcampus. Producers are research institutions, academies and educational institutions from all over Austria, Germany and Switzerland. The topics range from introductory lectures for various subjects to techniques of presentation and communication and from scientific problems to a snowboard video podcast.

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[27] http://calibrate.eun.org/ww/en/pub/calibrate_project/home_page.htm

[28] http://www.podcampus.de

As a ‘showcase of science’, Podcampus also offers interesting content for a more general audience outside of universities. Traditional learning opportunities by the academics can be complemented, improving the service for students. Any academics, as well as research and educational institution, can publish their seminars or lectures on Podcampus. Content within Podcampus can be sorted thematically, geographically and by several other criteria. Producers are free to publish their content via their own respective website.

In contrast to OpenLearn, Podcampus is an interesting example of a lightweight quality assurance model, where contributions are provided from experts, rather than from some formal, centralised quality-controlled process. It is also an example of a cross-national initiative, spanning three German-speaking countries.

Conclusion

This chapter has provided an overview of the OER landscape, considering the vision behind the value of the movement, the nature of OER, and describing a range of key initiatives that have emerged in recent years. OER appear to offer much in terms of helping to transform learning and teaching, fostering more effective use of technologies. The focus to date has primarily been on the creation of digital repositories of resources. However, evaluation of these indicates that learners and teachers are not using or repurposing these as much as might have been expected. As a result, a number of projects are now turning their attention to explore how a global networker of researchers and users of OER might be built and supported (e.g. the OLnet initiative[29] discussed in the next chapter) and to the articulation and use of the associated practices around OER in terms of creation, use and repurposing. The next chapter discusses open educational practices and in particular the work being carried out by the OPAL project.

Appendix: The Broader OER Landscape

United Kingdom

- Openlearn[30]
- SCORE[31]
- UK—JISC/HEA OER phase 1 programme[32]

[29] http://olnet.org

[30] http://Openlearn.open.ac.uk

[31] http://www8.open.ac.uk/score/

[32] See http://www.jisc.ac.uk/whatwedo/programmes/elearning/oer.aspx for a list of the projects and links to the project Websites.

- UK—JISC/HEA OER phase 2 programme[33]
- POCKET[34]

Ireland

- NDLR[35]

Holland

- OpenER[36]
- Wikiwjs[37]

Germany

- Akleon[38]
- KELDAmet[39]
- CampusContent[40]
- Podcampus[41]
- Zentrale für Unterrichtsmedien (ZUM)[42]
- Dual Mode Technische Universität Darmstadt[43]
- MatheVital[44]
- Skriptenforum[45]

Austria

- EducaNext[46]
- eLibrary Projekt[47]

Switzerland

- GITTA[48]

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33 See http://www.jisc.ac.uk/oer for a list of the projects and links to the project Websites.
34 http://olnet.org/taxonomy/term/469
35 http://www.ndlr.ie/
36 http://www.ou.nl/eCache/DEF/2/19/943.html
37 http://www.wikiwijs.nl/sector/
38 http://www.akleon.de/
39 http://www.ma.uni-heidelberg.de/apps/bibl/KELDAmed/
40 http://www.campuscontent.de/
41 http://www.podcampus.de/
42 http://www.zum.de/
43 http://www.e-learning.tu-darmstadt.de/elearning/dualmode/index.de.jsp
44 http://www.mathe-vital.de
45 http://www.skriptenforum.net/
46 http://www.educanext.org/
47 http://elib.at/
48 http://www.gitta.info/

Brazil

- UnisulVirtual[49]

North America

- CCCOER/CCOT[50]
- BC campus[51]
- MIT OpenCourseWare[52]

Finland

- EDU.Fi[53]
- AVO-SOMETU[54]
- Le Mill[55]

Estonia

- Estonia National Network[56]

Portugal

- INTERACTIC[57]
- Casa das Ciências[58]

Community Sites

- Peoples open access initiative[59]
- The peer to peer university[60]
- Wikieducator[61]
- Connections[62]
- Merlot[63]

[49] http://www.unisul.br/unisulvirtual/home.html
[50] http://oerconsortium.org/
[51] http://www.bccampus.ca/
[52] http://ocw.mit.edu/index.htm
[53] http://edu.fi/
[54] http://www.sometu.fi/
[55] http://lemill.net/
[56] http://cloudworks.ac.uk/cloud/view/3633
[57] http://interactic.ning.com/
[58] http://www.casadasciencias.org/
[59] http://www.peoples-uni.org/
[60] http://p2pu.org/
[61] http://wikieducator.org
[62] http://cnx.org/
[63] http://www.merlot.org

OER Research Groups

- Organisation for economic cooperation and development (OECD)[64]
- OER Commons[65]
- Open eLearning Content Observatory OLCOS[66]
- Open Learning network (OLNET)[67]

International Agencies

- OER AFRICA[68]
- The Commonwealth of Learning (COL)[69]
- UNESCO: open training platform[70]

Translation Organisations

- Opensource opencourseware prototype system[71]
- China open resource for education (CORE)[72]
- Creative commons[73]
- Universia.net[74]

Emerging Institutions

- Technologica de Monterrey[75]
- University of the western cape[76]
- Universiade do sul de santa catarina: unisul[77]

Established OER Projects

A number of funders (such as the Hewlett Foundation, Shuttleworth and UNESCO) have had and continue to have a significant influence on the nature of OER initiatives, both in terms of the funding they provide and also through other forms of promotion and support. Examples of different types of initiatives include EADTU/MORIL,[78] the EU-funded FP7 programmes, for example,

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64 http://www.oecd.org/document/20/0,3343,en_2649_35845581_35023444_1_1_1_1,00.html

65 http://www.oercommons.org/

66 http://www.olcos.org/

67 http://olnet.org/

68 http://www.oerafrica.org/

69 http://www.col.org/RESOURCES/CRSMATERIALS/Pages/default.aspx

70 http://oerwiki.iiep-unesco.org

71 http://myoops.org

72 http://www.core.org.cn/en

73 http://creativecommons.org/

74 http://mit.ocw.universia.net/

75 http://ocw.itesm.mx/

76 http://freecourseware.uwc.ac.za

77 http://www.unisul.br

78 http://moril.eadtu.nl/

ICOPER,[79] STELLAR[80] and the OpenScout initiative,[81] investigating various aspects of OER movements. The nature of these different initiatives is a combination of a number of factors:

- The nature of the type of funding which supports them
- The vision and motivation behind them
- The nature of the organisation or organisations involved (face-to-face/distance, subject-based, institutionally or nationally focused, single- or multi-partnered)[82]

The following alphabetical listing outlines a selection of these varied projects sourced[83]:

- Anadolu University, Yunus Emre Lifelong Open Learning Portal,[84] Turkey offers 149 content-rich courses free through its Yunus Emre education portal. The courses include the following components: e-books, e-courses, e-TV, e-audio books and e-practice.
- Athabasca University—Open University, Canada.[85] The University aims to remove the barriers of time, space, past educational experience and, to a great degree, level of income. Individualised study courses allow learners to learn at their own pace. Flexible instruction frees learners from the demands of specified class times and rigid institutional schedules. For undergraduate individualised study courses, there are no admissions deadlines; learners may enrol year-round.
- Budapest Open Access Initiative, Hungary.[86] The Budapest Open Access Initiative aims to make research articles in all academic fields freely available on the Internet.
- Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, Global.[87] The Berlin Declaration promotes the Internet as a functional instrument for a global scientific knowledge base and human reflection and to specify measures which research policy makers, research institutions, funding agencies, libraries, archives and museums need to consider.

[79] http://www.icoper.org/

[80] http://www.stellarnet.eu/

[81] http://www.openscout.net/

[82] http://www.anadolu.edu.tr/akademik/fak_aof/eindex.htm

[83] From http://wikieducator.org/Exemplary_Collection_of_institutions_with_OER_policy

[84] http://yunusemre.anadolu.edu.tr/

[85] http://www.athabascau.ca/

[86] http://www.soros.org/openaccess/read.shtml

[87] http://oa.mpg.de/openaccess-berlin/berlindeclaration.html

- Broadband Enabled Lifelong Learning Environment—BELLE, Canada.[88] BELLE was a $3.4 million shared-cost project (2002) funded under the CANARIE Learning Program. BELLE's objective was to develop a prototype educational object repository.
- Carnegie Mellon Open Learning Initiative (OLI).[89] Carnegie Mellon's Open Learning Initiative (OLI) is a collection of 'cognitively informed', openly available and free online courses and course materials that enact instruction for an entire course in an online format. The vision is that the courses developed and delivered through the OLI project will be used by instructors and students in colleges and universities throughout the world as well as individuals seeking education who are not affiliated with an institution.
- Commonwealth of Learning (COL), Global.[90] The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to encourage the development and sharing of open learning/distance education knowledge, resources and technologies. Two online databases of learning content provide support to commonwealth countries free of charge. Institutions or governments can use these repositories to access a range of free learning content.
- Digital Repository Infrastructure Vision for European Research (DRIVER).[91] DRIVER aimed to establish a cohesive, pan-European infrastructure of digital repositories for both researchers and the general public. It set out to build an advanced infrastructure for the future knowledge of the European Research Area.
- European Schoolnet (EUN), Europe.[92] European Schoolnet (EUN) is a consortium of 28 ministries of education in Europe. EUN provides major European education portals for learning, teaching and collaboration and leads the way in bringing about change in schooling through the use of new technology.
- Japanese OpenCourseWare Alliance (JOCW), Japan.[93] The JOCW is the consortium of Japanese universities that have been providing OCW in Japan.
- Joint Information Systems Committee (JISC) Digital Repositories, United Kingdom.[94] JISC has funded a range of initiatives around the creation and use of digital resources. This has included significant work on digital repositories.
- Joint Information Systems Committee (JISC) and Higher Education Academy (HEA) Open Educational Resources programme, United Kingdom.[95] Between April 2009 and April 2010, the JISC and the HEA funded a series of pilots and

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[88] http://belle.netera.ca/about.htm

[89] http://oli.Web.cmu.edu/Openlearning/

[90] http://www.col.org/Pages/default.aspx

[91] http://www.driver-repository.eu/

[92] http://www.eun.org/Web/guest;jsessionid=9126F04FD9B46DEA6697FB41FC8F9643

[93] http://www.jocw.jp/

[94] http://www.jisc.ac.uk/whatwedo/topics/digitalrepositories.aspx

[95] http://www.jisc.ac.uk/whatwedo/programmes/elearning/oer

activities to promote the open release of learning resources. Projects were required to make a significant amount of existing learning resources freely available online, licensed in such a way to enable them to be used and repurposed worldwide. Twenty-nine projects were funded in total, around three themes (individual researcher, institutionally based and subject based).

- Jorum, United Kingdom.[96] Jorum is funded by the JISC (the Joint Information Systems Committee). Jorum is a collaborative venture in UK higher and further education to collect and share learning and teaching materials, allowing their reuse and repurposing and standing as a national statement of the importance of creating interoperable, sustainable materials. Users can access the learning and teaching materials (which cover a range of subject areas) to enhance their students' learning experience. Materials range from single assets (documents, images, diagrams) to more comprehensive learning objects (interactive units and content packages). Jorum accepts learning and teaching resources across all subject areas for both higher and further education in the UK.
- IIEP-UNESCO Wiki of OER repositories, Global.[97] IIEP-UNESCO hosts a wiki that offers a list of several portals, gateways and repositories. It offers a list of links to OER initiatives, resources and tools. It offers access to a selection of approximately 30 repositories of open learning objects, mostly at the university level.
- ide@s, North America.[98] This is an initiative by the University of Wisconsin to identify, evaluate, catalogue and align to the Wisconsin education standards resources that are already on the Internet, such as lesson plans and reference materials. These resources are then made available from the ide@s search engine for prekindergarten to higher education and adult education.
- Maricopa Learning eXchange (MLX), North America.[99] The Maricopa Learning eXchange (MLX) is an electronic warehouse of ideas, examples and resources that support student learning for the state of Arizona Maricopa community colleges. These resources include lessons, techniques, methods, activities and assignments.
- Monterey Institute for Technology and Education National Repository of Online Courses (NROC), North America.[100] NROC is a library of high-quality online courses for students and academics in higher education, high school and Advanced Placement.
- National Learning Network (NLN) Materials, United Kingdom.[101] Working in partnership with subject experts and commercial developers, BECTA's (British

[96] http://www.jorum.ac.uk/

[97] http://oerwiki.iiep-unesco.org/index.php?title=Repositories

[98] http://www.ideas.wisconsin.edu/

[99] http://www.mcli.dist.maricopa.edu/mlx/

[100] http://www.montereyinstitute.org/nroc/

[101] http://www.nln.ac.uk/

Educational Communications and Technology Agency) the NLN Materials Team commissioned and managed the development of further education e-learning materials for use in virtual learning environments. The materials cover the UK post-16 further education curriculum and were designed to be fitted easily into existing teaching.

- Open Archives Initiative (OAI).[102] The Open Archives Initiative develops and promotes interoperability standards that aim to facilitate the efficient dissemination of content. OAI has its roots in the open access and institutional repository movements.
- OpenCourseWare Consortium (OCW), Global.[103] The OpenCourseWare Consortium is a collaboration of more than 100 higher education institutions and associated organisations from around the world creating a broad and deep body of open educational content using a shared model.
- ParisTech, France.[104] ParisTech is a collective entity that includes 12 of the most prestigious French institutes of education and research.
- Multimedia Educational Resource for Learning and Online Teaching) (MERLOT), North America.[105] MERLOT provides free and open resources designed primarily for academics and students of higher education. MERLOT is a catalogue of online learning materials, peer reviews, learning assignments, and user comments, organised by discipline into specific discipline communities and created to help academics enhance their instruction, and that anyone can use for free.
- OER Commons, North America.[106] OER Commons is a learning and teaching network offering a broad selection of high-quality Open Educational Resources that are freely available to use online and, in many cases, to adapt and support individualised learning and teaching practices.
- Open Courseware Directory (OCD).[107] The Open Courseware Directory is an annotated listing of publicly available courseware (lecture notes, handouts, slides, tutorial material, exam questions, quizzes, videos, demonstrations, etc.) from the world's universities, colleges and other educational institutions worldwide.
- OpenCourseWare Finder, North America.[108] The OCW Finder aggregates materials across several collections: MIT OCW, Utah State University, Johns Hopkins School of Public Health OCW, Tufts University OCW, Foothill De-Anza SOFIA and Carnegie Mellon Open Learning Initiative.

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102 http://www.openarchives.org/

103 http://www.ocwconsortium.org/about-us/about-us.html

104 http://www.paristech.fr/en

105 http://www.merlot.org/merlot/index.htm

106 http://www.oercommons.org/

107 http://iberry.com/cms/OCW.htm

108 http://www.ocwconsortium.org/ocw-course-finder/index.php

- SchoolNet, Canada.[109] In English and French, SchoolNet is a partnership with the provincial and territorial governments, the education community and the private sector in Canada, which promotes the effective use of information and communications technologies (ICT) in learning.
- Textbook Revolution, Global.[110] Textbook Revolution is a student-run site dedicated to increasing the use of free educational materials by teachers and professors. The approach is to bring free textbooks together in one place.
- The Centre for Excellence in Teaching and Learning in Reusable Learning Objects (CETL), United Kingdom.[111] The Centre for Excellence in Teaching and Learning (CETL) in reusable learning objects developed, shared and evaluated learning objects. The aim was to promote innovation in pedagogical design and to encourage more widespread use and reuse of high-quality learning objects.
- United Nations University (UNU) Open Course Ware, Global.[112] The United Nations University is a member of the OpenCourseWare (OCW) Consortium and is committed to the development of an OCW Website that showcases the training and educational programmes implemented by the University in a wide range of areas relevant to the work of the United Nations.
- World Lecture Hall (WLH), North America.[113] The World Lecture Hall publishes links to pages created by academics worldwide who are using the Web to deliver course materials in any language. Some courses can be accessed as full text. Materials include syllabi, course notes, assignments, and audio and video streaming. The WLH contains links to course materials for university-level courses.
- Wisconsin Online Resource Center, North America.[114] The Wisconsin Online Resource Center is a digital library of Web-based learning resources.

References

Atkins, D. E., Seely Brown, J., & Hammond, A. L. (2007). *A review of the Open Educational Resource movement: achievements, challenges and new opportunities*. Report to the William and Hewlett Foundation. Available online at http://www.hewlett.org/uploads/files/ReviewoftheOERMovement.pdf. Accessed 7 Sept 2011.

Borgeman, C. L., Abelson, H., Dirks, L., Johnson, R., Koedinger, K., Linn, M. C., Lynch, C. A., Oblinger, D. G., Pea, R. D., Salen, K., Smith, M., & Azalay, A. (2008). *Fostering learning in the networked world: The cyberlearning opportunity and challenge*. Report of the NSF task force on cyberlearning. Available online at http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf. Accessed 7 Oct 2011.

[109] http://www.schoolnet.org.uk/

[110] http://textbookrevolution.org/index.php/Main_Page

[111] http://www.rlo-cetl.ac.uk/joomla/index.php

[112] http://ocw.unu.edu/

[113] http://wlh.Webhost.utexas.edu/

[114] http://www.wisc-online.com/

Hylén, J. (2006). *Open Educational resources: Opportunities and challenges*. Proceedings of Open Education. Available online at http://www.knowledgeall.net/files/Additional_Readings-Consolidated.pdf. Accessed 7 Oct 2011.

Iiyoshi, T., & Kumar, M. S. V. (2008). *Opening up education: The collective advancement of education through open technology, open content, and open knowledge*. Cambridge, MA: MIT Press.

Keller, P., & Mossink, W. (2009). Reuse of material in the context of education and research, SURFdirect, The Netherlands. Available online at http://learn.creativecommons.org/wp-content/uploads/2009/07/090706surfcc_reuse_materiaal_def.pdf. Accessed 7 Oct 2011.

Lane, A. (2006). *From pillar to post: Exploring the issues involved in re-purposing distance learning materials for use as Open Educational Resources* (Openlearn working paper). Milton Keynes: The Open University. http://kn.open.ac.uk/public/document.cfm?docid=9724. Accessed 7 Oct 2011.

McAndrew, P. (2006). *Motivations for Openlearn: The Open University's open content initiative*. Openlearning workshop paper. Paper presented at the THe OECD experts meeting on Open Educational Resources. Retrieved from http://kn.open.ac.uk/public/document.cfm?docid=8816. Accessed 7 Oct 2011.

McAndrew, P., Santos, A., Lane, A., Godwin, S., Okada, A., Wilson, T., Connolly, T., Ferreira, G., Buckingham Shum, S., Bretts, J., & Webb, R. (2009). *Openlearn research report 2006–2008*. Milton Keynes: The Open University.

Oblinger, D., & Lombardi, M. M. (2008). Common knowledge: Openness in higher education. In T. Iiyoshi & M. S. V. Kumar (Eds.), *Opening up education: The collective advancement of education through open technology, open content and open knowledge* (pp. 289–400). Cambridge, MA: MIT Press.

OECD. (2007). Giving knowledge for free – The emergence of open educational resources: OECD. Available online at http://www.oecd.org/dataoecd/35/7/38654317.pdf. Accessed 7 Oct 2011.

UNESCO. (2002). *Open Educational Resource open content for higher education*. Final forum report. Available online at http://www.unesco.org/iiep/eng/focus/opensrc/PDF/OERForumFinalReport.pdf. Accessed 7 Oct 2011.

Chapter 13
Realising the Vision of Open Educational Resources

Introduction

The previous chapter introduced the vision behind the open educational resource (OER) movement and described some of the key OER initiatives. However, it argued that despite the considerable investments in OER work, uptake, use and reuse by learners and teachers have been disappointing (McAndrew et al. 2009). Ehlers argues that:

> Although Open Educational Resources (OER) are high on the agenda of social and inclusion policies and supported by many stakeholders of the educational sphere, their use in HE and adult education (AE) has not yet reached the critical threshold which is posing an obstacle to the seamless provision of high quality learning resources and practices for citizens' lifelong learning efforts. (Ehlers 2011)

Conole and McAndrew (2010) notice a similar lack of uptake. They argue that finding appropriate resources and knowing how to use them is a specialised skill and that although many learners and teachers are technically competent, they lack the appropriate academic skills to harness the potential of OER. Hence, it is evident that making OER available is not enough to ensure effective uptake; learners and teachers need guidance and support on how to deconstruct and redesign OER for their own context. This chapter will explore ways in which we might address this issue, drawing on work under two initiatives, OLnet and OPAL.

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_13,

The OLnet Initiative

OLnet[1] was set up to ensure that researchers and users of OER are more closely aligned. It was a partnership between Carnegie Melon University and the Open University, UK. It had a number of strands of activities, including research projects, a fellowship scheme and the development and facilitation of a technical infrastructure to support dialogue and sharing across a distributed OER community. It builts on the experiences derived from the development and evaluation of the Open University's OER repository, OpenLearn,[2] and the Carnegie Mellon Open Learning Initiative (McAndrew and Thille 2009).[3] McAndrew et al. (2009) drew a number of conclusions from the evaluation of the use of OpenLearn and the Open Learning Initiative. Conole and McAndrew (2010) list a number of research questions around the design and use of OER:

- What are the most effective ways to develop OER?
- What intellectual property issues have arisen from OER initiatives?
- What are the barriers and enablers to the development and use of OER?
- What models are different initiatives adopting in terms of the production of OER?
- What sustainable business models are evident for OER?
- What accessibility and inclusion issues are arising as a result of the promotion and use of OER?
- What new pedagogical models are needed to support the use of OER across both formal and informal learning contexts?
- What methods are appropriate to evaluate the effectiveness of OER and how can transfer of good practice be best achieved?

The OLnet initiative attempted to address these issues. It aimed to provide a global socio-technical network for researchers, users and producers of OER, alongside a series of face-to-face events. It also aimed to better articulate the design and evaluation of OER and to support and foster the transfer of good practice through sharing and debate. In the original OLnet proposal, McAndrew and Thille (2009) articulate the following research question: How can we build a robust evidence base to support and enhance the design, evaluation and use of OER? This has three subquestions: (1) how to improve the process of OER design, reuse, delivery, evaluation and data analysis; (2) how to make the associated design processes and products more easily shared and (3) how to build a socio-technical infrastructure to serve as a collective evolving intelligence for the community.

The technical infrastructure consists of a set of open, social and participatory tools for aggregating, sharing, debating and improving the quality of OER. The platform builds on an existing set of tools, including a learning design visualisation

[1] http://olnet.org/

[2] http://openlearn.open.ac.uk

[3] http://oli.Web.cmu.edu/openlearning/

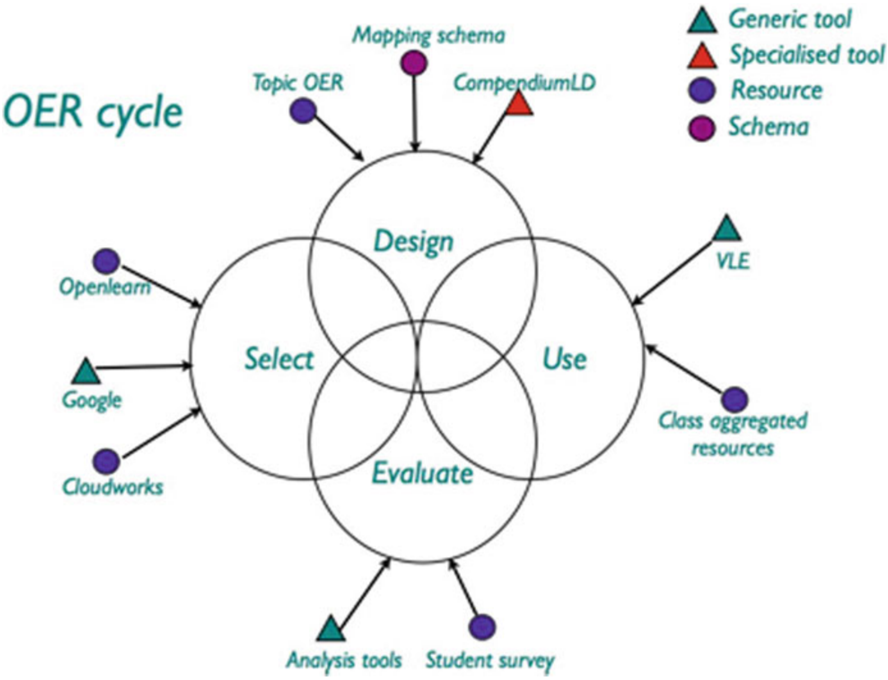

Fig. 13.1 The OLnet OER effectiveness life cycle

tool, CompendiumLD (Conole et al. 2008), a social networking site for sharing and discussing learning and teaching ideas, Cloudworks (Conole and Culver 2009, 2010) and a semantic argumentation tool, Cohere[4] (De Liddo and Buckingham Shum 2010). Examples of research studies include 'integrating pedagogies and technologies that support individual learning and group knowledge building', 'learning design of OER' (Conole and McAndrew 2010), 'using pedagogical patterns to promote the use of OER for collaborative learning' (Conole et al. 2010) and creativity and OER.[5]

A key concept underpinning OLnet is the notion of an OER effectiveness life cycle, which consists of four stages: select, design, use and evaluate (Fig. 13.1). It can be used to describe both small-scale interventions (e.g. a learner or teacher using an OER) and large-scale interventions (such as the establishment and promotion of an institutional OER repository). The figure provides examples of tools (both generic and specialised) and resources associated with each stage. In the select stage, a user might use a combination of Google, an OER repository like OpenLearn[6]

[4] http://cohere.open.ac.uk/

[5] http://www.eurodl.org/

[6] http://openlearn.open.ac.uk

and a social networking site like Cloudworks[7] to find and discuss the relevance of particular OER for use in their own context. In the design stage, a user might focus on a particular OER and use a mapping schema and the learning design tool CompendiumLD[8] to deconstruct and redesign the OER. In the use stage, the user might integrate the redesigned OER with other class resources into an institutional learning management system (LMS) such as Blackboard or Moodle. Finally, in the evaluation stage, the user might develop and deploy a learner survey and then use a range of research analysis tools to analyse the data collected.

Conole and McAndrew (2010) see OER as 'social objects' (Engeström 2005, 2007):

> We want to emphasise that we see the cycle as reflexive: OER are not the only objects of interest. Any of the design representations or other artefacts generated, or used to analyze, OER design can themselves become 'social objects', that is, artefacts shared, deployed, evaluated and improved on by the community. Each stage in the cycle can therefore generate specific outputs such as a design representation or new evaluation instruments, which can be put back into the OLnet community for others to use. So for example a user might query an existing OER repository such as OpenLearn as a means of selecting an OER for use. Another user might develop a new survey instrument for evaluating the use of a science-focused OER which they then make available to the OLnet community, and yet another user might then use that instrument to evaluate their own use of a Science OER. Thus, the very infrastructure that we use to accomplish this process – OLnet – becomes the object of reflection, hence the same effectiveness cycle applies to OLnet itself at the system level.

Figure 13.2 shows how the knowledge and experience gained from one OER cycle can be shared and reapplied across the network in other cycles. So a design representation in one cycle can be picked up and used as a starting point for a different OER cycle or evaluation findings on the use of one OER can be used to inform and shape the design of a different OER.

The aim of OLnet, through the collective activities described here, was to ensure that OER research findings inform practice. It also aimed to provide a socio-technical infrastructure to enable researchers and users of OER to communicate and share understandings.

Recently, OLnet created an evidence hub for OER; McAndrew provides a demonstration of the hub and the aspirations behind its development (McAndrew 2011).[9] They state that:

> The Open Education Evidence Hub aims to provide an environment to systematically interrogate the Open Education movement on what are the people, projects, organizations, challenges, solutions and claims that scaffold the movement. Ultimately CI-OLnet will build an evidence hub which represent and maps the collective knowledge and the collective memory of the Open Education community.

The hub is based on the Cohere[10] semantic meaning tool. Users can collective add information about OER initiatives and make links between different themes,

[7] http://cloudworks.ac.uk

[8] http://compendiumld.open.ac.uk

[9] http://ci.olnet.org

[10] http://cohere.open.ac.uk

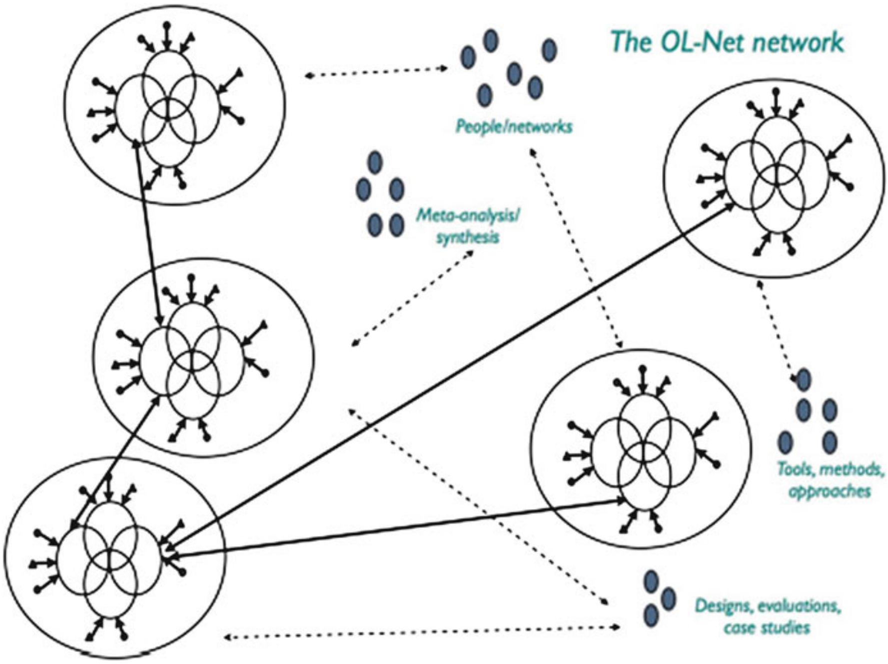

Fig. 13.2 The dynamic and evolving OLnet network

evidence and proposed solutions on how OER might be used. In particular, the Evidence Hub provides OER researchers and practitioners with an environment where:

- New projects and organisations can be added to the OER network.
- New challenges and questions can be posted, explored and discussed.
- New solutions can be proposed to tackle the major challenges facing open education.
- Relevant evidence and Web resources for the OER community can be shared to contribute to the evidence base of OER impact on teaching and learning.
- New claims of OER effectiveness can be made and investigated that are informed by the OER research debate and backed by robust evidence in favour and against such claims.

The OPAL Initiative

The overall aim of OPAL[11] was to improve the effectiveness of learning and teaching by enhancing the quantity and quality of open educational resources that can be incorporated into higher education and further education provision. OPAL focused on

[11] http://www.oer-quality.org

the articulation of a set of dimensions of open educational resource practices (OEP) around the creation, use and management of OER, with the belief that identification of these practices will lead to better innovation in the pedagogical use of OER and improvements in the quality of OER designed and used. As described in the previous chapter, the project began by reviewing 60 case studies of OER initiatives[12] and from these derived a set of dimensions of OEP. A full account of this research is available elsewhere (OPAL 2010). The following sections are adapted from this more detailed report.

Open educational practices are practices where the concept of openness refers to opening and enabling access to resources. The vision behind it is to achieve a situation in which resources are no longer the sole focus but in which the practices within a specific domain are the focus of education. The vision of open educational practice includes a move from resource-based learning and outcome-based assessment to a learning process in which social processes, validation and reflection are at the heart of education, and learners become experts in judging, reflecting, innovating and navigating through domain knowledge.

OER practices are concerned with opening up educational practices, for example, by shifting from teacher-directed to learner-centredness, where learners can be more actively involved in the creation and use of resources for their learning. It is about teachers moving away from content-centred teaching to learner-centred facilitation and about learning processes being seen as productive processes. Finally, the importance of learning outcomes is recognised, and they are seen as artefacts which are worth sharing and debating, improving and reusing.

Open educational practices have a 'life cycle' which is influenced by:

- National policy makers, who are promoting the use of open educational resources
- Leaders of higher education institution, who might embark on an institution-wide open education debate in which teachers are asked to create, find, adapt and share OER in an institution-wide OER repository and in which educational strategies and models are collected and shared amongst teachers
- Teachers, who are encouraging learners to produce, share and validate content
- Learners, who are using openly available content to create knowledge landscapes on study topics which better fit their needs than the available textbook 'one-size-fits-all' style

Eight initial OEP dimensions were identified from the case studies analysed as part of the OPAL initiative; these are discussed below, along with some illustrative examples drawn from the case studies:

- Strategies and policies
- Quality assurance models
- Partnership models
- Tools and tool practices

[12] http://cloudworks.ac.uk/cloudscape/view/2087

- Barriers and success factors
- Innovations
- Skills development and support
- Business models/sustainability strategies

Strategies and Policies

At the policy level, the most evident dimension was ‘strategies and policies’. Strategies include (1) national-level engagement or support, (2) adopting a national-level initiative to pool expertise, gaining critical mass and developing a vibrant community (such as NDLR[13] in Ireland, BCcampus[14] in Canada, Wikiwijs[15] in Holland), and (3) provision of a coherent national focus through a repository and associated events and support mechanisms (such as the NDLR, Wikiwijs, SCORE,[16] Koolielu[17] and TIGER Leap[18] activities).

Policy makers implement policy around OER through key white papers; see, for example, the NSF cyberlearning report from America (Borgeman et al. 2008), via inclusion in strategy documents (see, e.g. the UK HEFCE e-learning strategy[19]), through funding calls (see, e.g. the international work supported by the William and Flora Hewlett Foundation[20] and the Joint Information Systems Committee/Higher Education Academy (JISC/HEA)-funded OER programme[21] in the UK) or through acting as a front to promote OER initiatives (e.g. the public support of the Dutch education minister for the Wikiwijs initiative[22]) and the support for the OER movement by UNESCO.[23]

Policies include having in place a national-level policy drive. For example, in the UK, the OER programme funded by JISC and the HEA focused on making a significant amount of existing learning resources freely available online and licensed in such a way to enable them to be used and repurposed worldwide. The focus was on existing materials, rather than on the creation of new OER, which is a significant shift from earlier OER-funded initiatives, such as those supported by the Hewlett Foundation.

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[13] http://www.ndlr.ie/

[14] http://www.bccampus.ca/

[15] http://www.wikiwijs.nl/sector/

[16] http://www8.open.ac.uk/score/?samsredir=1300866542

[17] http://www.koolielu.ee/

[18] http://www.heacademy.ac.uk/projects/detail/oer/OER_REL_Northampton

[19] http://www.hefce.ac.uk/learning/techlearn/strategy/

[20] http://www.hewlett.org/

[21] http://www.heacademy.ac.uk/ourwork/teachingandlearning/oer

[22] http://www.wikiwijs.nl/sector/

[23] http://oerwiki.iiep-unesco.org/index.php?title=Main_Page

Three main strategies have emerged at the organisational level: (1) the extent to which initiatives are bottom up versus top down within institutions, (2) lightweight/user-driven versus institutional structured workflow and (3) the degree to which students are actively involved. Policies in place at the organisation level obviously need to be of a different level of granularity to those at the national level and include:

- The need to adhere to the initiatives' policies in order to be able to join (CampusContent,[24] NDLR[25]).
- A requirement to adhere to open source principles and approaches.
- Adhering to existing policy practices and standards. For example, the CCCOER project points to the WikiEducator[26] exemplary collections of institutions with OER policies and also to the DLISE review[27] of collections best practices.
- Linking to national or broader policy agendas. For example, the OpenER project[28] links to the Lisbon agenda,[29] feeding through Dutch government objectives in this area.
- Mainstreaming OER work into institutional business provision. This was a core object of the OpenLearn initiative in the UK. Many other initiatives are coming to regard the importance of building in sustainability and embedding into core institutional processes as an essential part of their overall strategy.

Quality Assurance Models

A range of quality assurance (QA) models was evident across the case studies. These depended on a number of factors: the type of institution and their learning and teaching culture, the perceived 'value' of teaching (in comparison to research activities in the institution), the degree to which OER activities were seen as research activities in their own right, the level of e-learning maturity of the institution and the extent to which they had engaged with OER work previously.

QA models range from lightweight, user-defined models to strictly controlled hierarchical models. An example of a lightweight and user-driven model came from the Southampton University case study and their EdShare project.[30] They provided the option of either open-Web sharing or institution-only sharing, according to the

[24] http://www.campuscontent.de/mcportal/Web/cc

[25] http://www.ndlr.ie/

[26] http://wikieducator.org/Exemplary_Collection_of_institutions_with_OER_policy

[27] http://www.oerderves.org/2007/03/a-review-of-the-open-educational-resources-oer-movement/

[28] http://www.oecd.org/dataoecd/4/53/38149140.pdf

[29] http://www.esep.co.uk/03-info-lisbon-agenda.html

[30] http://www.edshare.soton.ac.uk/

wishes of the academics involved. The OER are made available as simple assets (such as PowerPoint, Word or PDF files); that is, standard formats that academics are used to producing in their everyday practice. In terms of QA and adherence to standards, this is very much a lightweight approach; no adherence to IMS[31] standards is required. OpenExeter[32] is another example of quality control being driven by academics, although interestingly, it does adhere to IMS standards and is SCORM[33] compliant. It is interesting to note that Southampton and Exeter would both view themselves as 'research-focused' institutions, where the academic view is still privileged; hence, such lightweight, academic-driven approaches are to be expected. In fact, this does appear to be quite a common approach adopted by many of the case studies, certainly some of the more recent, smaller initiatives.

In contrast to these lightweight models, the OpenLearn initiative[34] is a good example of a top-down controlled QA model, with clearly articulated quality processes and identified roles (authors, editors, technical support, quality assurers, etc.). Again, this can be seen as both a consequence of the unique position in the UK as a large-scale distance educational institution, with a well-established, Fordish (Thompson, n.d.) production model for course production and presentation, and due to the fact the project received considerable funding from the Hewlett Foundation for OpenLearn and hence was in a better position to set up more rigorous and complex roles and processes.

Other case studies can be seen as examples along a spectrum from lightweight to more controlled QA models, and a number of examples of the QA practices are evident from across the case studies. These practices include the use of peer reviewing as a means of assuring quality (e.g. in the GITTA project[35] and the Estonia school projects[36]), defining criteria for peer production and open content (the AVO project[37]) and more organic and community peer review based, relatively linear quality assurance models, where quality assurance checks and processes are embedded into the workflow for production of OER, and finally, annotation through experts which help the users through the learning materials, multilevel reviews or reviews against a set of predefined criteria.

An example of a relatively linear quality assurance model is the OpenER project,[38] where authors are required to produce and submit content, which is then checked, converted and rechecked. EducaNext[39] is an example of a more organic,

[31] http://standards.ieee.org/

[32] http://as.exeter.ac.uk/support/educationenhancementprojects/openexeter/

[33] http://en.wikipedia.org/wiki/Sharable_Content_Object_Reference_Model

[34] http://openlearn.open.ac.uk

[35] http://www.gitta.info/Website/en/html/index.html

[36] http://cloudworks.ac.uk/cloud/view/3633

[37] http://www.eoppimiskeskus.fi/en/avo

[38] http://www.ou.nl/eCache/DEF/2/19/943.html

[39] http://www.educanext.org

community-based model, where members are able to comment on published content or run a complete course evaluation. KELDAmed[40] is another example, which includes annotation by experts, who are then available to help the users through the learning materials.

CampusContent[41] has multilevel reviews, where experts review material and then learners can further improve shared understanding of the OER through their own annotations. Podcampus[42] is an interesting example of a lightweight QA model, where experts provide the contributions. Another community-based model can be seen in the CCCOER/CCOT initiative,[43] which enables educators to share reviews of materials and also to look at and comment on the reviews of others. The CCOT reviews are done against a set of predefined criteria. These include sub-dimensions around accuracy, importance or significance, pedagogical effectiveness, completeness of documentation, ease of use for learners and teachers, inspirational and motivational for learners and robustness as a digital resource. Another interesting model is that adopted by eLibrary,[44] which involved multiple stakeholders, who can contribute to both the development and improvement of the resources in a variety of different ways.

Collaborative and Partnership Models

Some OER initiatives involved more than one organisation and a number of collaborative (non-contract) and partnership (contractual) models have emerged. In some cases, these include different types of academic institutions (universities, technical universities, colleges, etc.); in other cases, they focus on specialist areas, each led by a senior academic in that field.

The GITTA project[45] involved ten Swiss partner institutions who jointly developed and operated learning content for academic education in the field of geoinformatics. The partners were interdisciplinary institutions and different types of academies (universities, technical universities, colleges), as well as multilingual.

The TRUE project[46] consisted of 14 specialist areas, each led by a senior academic in the field. Each specialist leader gathered and collated materials from colleagues in various universities. Resources included syllabus details, reading lists, lecture slides, seminar/workshop materials, problem sets and worksheets, student handouts, assessment schemes, past assessments and module/unit handbooks.

40 http://www.umm.uni-heidelberg.de/apps/bibl/KELDAmed/index_e.html

41 http://www.campuscontent.de

42 http://www.podcampus.de/

43 http://www.collegeopentextbooks.org

44 http://cloudworks.ac.uk/cloud/view/3615

45 http://www.gitta.info/Website/en/html/index.html

46 http://www.economicsnetwork.ac.uk/projects/oer

The AVO project[47] has a dozen organisations and tens of experts involved and operates through the national network eOppimiskeskus, the Association of Finnish eLearning Centre. Ope.fi is aimed at teachers in Finland and focuses on learning materials that would otherwise not be published, that is materials that are not of interest for the commercial publishing companies and materials that are not likely to have a large enough audience in order to make publishing worthwhile from the economics point of view.

As discussed in the last chapter, LeMill[48] is an international Web community of teachers and other learning content creators for finding, authoring and sharing open educational resources. LeMill provides reusable learning content resources, descriptions of learning and teaching methods and descriptions of learning and teaching tools. There are also learning and teaching stories available.

In Canada, the BCcampus OER initiative[49] has been implemented in 25 institutions, through a multi-institutional partnership, which involves staff from more than one institution. At the moment, however, these resources are only shared amongst these 25 institutions and are not available more widely.

The eLibrary project[50] uses volunteers from national eLibraries to help digitise content and then works with scientists and students to publish it. Employers also help to create and maintain content.

An interesting example of a partnership mode is that between OpenLearn and UnisulVirtual,[51] who chose materials from the existing OpenLearn platform for translation into Portuguese. Materials were analysed by UnisulVirtual tutors and chosen on their suitability in terms of relevance, clarity and depth.

Tools and Tool Practices

A rich range of tools and tool practices emerged from the case studies, exploiting the full potential of new technologies to support the sharing and critiquing of resources. In some cases, institutional learning management systems (LMS) have been adapted; in other cases, specialised digital repositories were created. More generally, Web 2.0 tools (such as wikis, blogs, social networking sites) are being used in a variety of ways to foster and promote a community of practice (Wenger 1998) around OER. Not surprisingly, in general, there is strong support for adopting open practices. Most projects subscribe to some form of creative common licensing, in particular use attribution, non-commercial use and share-alike.

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47 http://sometu.wikispaces.com/AVO+project

48 http://lemill.net/

49 http://www.bccampus.ca/

50 http://elib.at/index.php/Hauptseite

51 http://www.unisul.br/unisulvirtual/home.html

The Connexions initiative[52] was mentioned across a number of the case studies as a valuable system for sharing and editing OER. Similarly, the eduCommons[53] content management system has been used as an OER platform by a number of projects (e.g. OpenER). OpenLearn used the open source learning management system (LMS) Moodle for hosting their OER, whereas others used commercially available LMS (e.g. NDLR used Blackboard). Rather than create a separate platform, UnisulVirtual, choose to use the OpenLearn platform. OpenExeter[54] chose to use their existing Information Technology Infrastructure Library system, whereas U-NOW[55] developed a conventional website. Some used relatively lightweight packaging and distribution of OER (using Word files in ZIP and PDF formats), whereas others adopted an XML-based framework. GITTA for example used eLML (eLesson Markup Language).[56] A number of the sites incorporated or developed specialised repository tools to enable different types of search (e.g. AKLEON,[57] Koolielu[58] and Waramu[59]) or KELDA[60] (an annotated database).

Web 2.0 tools were used in a variety of ways. ZUM-Unity[61] used forums and blogs as a means of exchanging ideas. In contrast, a number of projects chose wiki-based systems—sometimes for storage and sometimes to promote discussion and community building (e.g. the UNESCO wiki,[62] Wikiwijs, ZUM-wiki[63] and Skriptenforum eLibrary,[64]). MatheVital[65] used a repository plus a wiki for annotation. More specialised OER, such as podcasts, have either been distributed via specialised podcasting platforms (as in the case of Podcampus) or via iTunes (i.e. the OUUK and the OpenSpires project[66] at Oxford University). eLibrary used Voice-Over-IP and instant messaging. Other Web tools, such as Twitter and YouTube, have also been used as a means of distributing information across the various OER initiatives. CCOT used the social networking site Ning[67] to promote community engagement. The AVO project includes SOMETU,[68] which is also Ning based and provides

[52] http://cnx.org/

[53] http://educommons.com/

[54] http://www.jisc.ac.uk/whatwedo/programmes/elearning/oer/openexeter.aspx

[55] http://unow.nottingham.ac.uk/about.html

[56] http://www.elml.ch/Website/en/html/index.php

[57] http://www.akleon.de/

[58] http://arhiiv.koolielu.ee/

[59] http://trac.htk.tlu.ee/waramu

[60] http://www.ma.uni-heidelberg.de/apps/bibl/KELDAmed/

[61] http://unity.zum.de/

[62] http://oerwiki.iiep.unesco.org/index.php/Main_Page

[63] http://wiki.zum.de/Hauptseite

[64] http://www.skriptenforum.net/index.php/Hauptseite

[65] http://www-m10.ma.tum.de/bin/view/MatheVital/WebHome

[66] http://openspires.oucs.ox.ac.uk/

[67] http://www.ning.com/

[68] http://sometu.ning.com/

a forum for people who are interested in the potential that social media offers for learning. It is described as a tool that ‘not only helps expand one’s knowledge but promotes business, eDemocracy, citizen activism and leisure activities in the digital age’ (Nakki et al. 2011). The Koolielu portal is built on top of Elgg[69]—an open source social networking tool. More recently, a number of projects have been using the Cloudworks site as a means of sharing and discussing OER issues and practices (e.g. OpenExeter, OLnet, the Hewlett grantees and NROC), see Alevizou et al. (2010) for an evaluation of the use of Cloudworks by the OER community. AVO is also exploring the use of virtual worlds (along with mobile devices, blogs, wikis and other social media tools). Finally, a number of tools have emerged to support visualising OER, both in terms of making their inherent designs explicit (CompendiumLD) and to support visualisation of argumentation about OER issues (Compendium and Cohere).

At the educational level, in addition to the above, a number of other factors emerged. There were some good examples of the use of voting and recommendation tools to enhance community engagement and develop shared consensus and syndication formats like RSS and RSS aggregators to distribute metadata and provide access to content. Blogs, wikis and discussion forums have all been used as spaces to discuss OER/OEP and to co-create a shared understanding, and there are also examples of the use of social networking sites and file sharing services (such as Flickr, SlideShare and YouTube). Collectively, there is evidence that these tools enable peer critiquing and commenting, which is leading to an improved shared collective understanding. Community-based tagging—use of folksonomies to create metadata and tagging—has become more important as users have shifted away from predefined metadata categories.

Adopting open practices is, perhaps not surprisingly, fairly common. The emergence of the Creative Commons licence[70] was a major breakthrough in terms of providing a means for projects to label the level of attribution and the degree of sharing they wanted on the resources. Most of the case studies reviewed from the UK, for example, use attribution, non-commercial, share-alike licences. However, some projects were not comfortable with the share-alike option, meaning that repurposing of the OER was not possible. More generally, in terms of adopting open practices, there are a range of approaches; for example, some projects have deliberately chosen to use open source tools (such as Moodle), whereas others have opted for bespoke systems or commercially available products. Likewise projects differed in their attitudes to adherence to open standards ranging from full to no compliance. In the BCcampus project, OER developers have a choice of two licensing options: Creative Commons ShareAlike-Attribution Canada licence or the BC Commons licence (90% have chosen the latter).

[69] http://www.elgg.org/

[70] http://creativecommons.org/

Innovations

Innovations evident included the use of tools specifically for the creation and use of OER (Connexions,[71] OpenLearn[72] and eduCommons[73] are particularly noteworthy), as well as examples of innovation in the application of Web 2.0 practices to creation and use of OER (such as use of blogs, wikis, open repositories, RSS feeds and social bookmarking).

Examples of good practice were seen in a number of cases in the development of communities around OER, such as the NDLR[74] communities of practice approach, EducaNext and LeMill. As discussed elsewhere in this book, some work has been done more recently to help make the design of OER more explicit and application of the principles from pedagogical patterns works (Conole et al. 2010), and there is clearly more potential for aligning research understandings from the field of pedagogical patterns to the design and use of OER.

There were also examples of good practice in terms of support mechanisms that had been put in place for staff—such as training materials, events and workshops. See for example the NDLR programme of activities, the Campus promo kit[75] and the materials produced by UnisulVirtual. The AVO project appears to be innovative in terms of trying to harness Web 2.0 practices. Its stated outcomes are the development of 'new networks and forums to facilitate a Web 2.0-learning culture, handbooks and toolkits for teachers, decision-makers and citizens about social media, patterns for social networking and open content production, roadshows and online conferences, hands-on workshops and seminars to train users to apply digital tools to their everyday activities'. Another aspect of AVO that can be considered as innovative in that it connects actors and activists of OEP in Finland into a nationwide network. Estonian initiatives are taking care of interconnections with other repositories. For example, the learning materials stored in the Estonian Koolielu can also be searched through the European Learning Resource Exchange portal. UnisulVirtual made an online course available via the OpenLearn platform but complemented this with local tutor support paid for by the university.

Other innovations included provision of easy mechanisms to exchange both content and information about related OER activities (EducaNext), effective application of open source principles and licences (UnisulVirtual and the University of Leicester case study), use of simulation environments to provide learners with a very visual, quasi-haptic approach to abstracting data (MatheVital), making lessons available at multiple levels for different types of learners and the generation of solution-orientated case studies (GITTA), the creation of new networks of peer learning

[71] http://cnx.org/

[72] http://openlearn.open.ac.uk

[73] http://educommons.com/

[74] http://www.ndlr.ie/

[75] http://oerconsortium.org/campus-kit/

for experts of different fields (AVO) and student-led initiatives, where students share collections of minutes, notes and scripts which they took in lectures and seminars in universities.

Skills Development and Support

A range of mechanisms have been used to overcome academics' initial concerns about OER and to help with skills development and support. These include mechanisms to foster and support community engagement, provision of case studies of good practice and exemplars, running of staff development events and workshops and provision of specific training materials. For example, the Campus promo kit includes marketing materials, guidelines and tutorials on OER, an open textbook adoption worksheet, an OER needs assessment survey, policies and models. The NDLR and LeMill both adopt a community of practice (CoP) approach and aim to facilitate the development of CoP around the OER to provide mutual peer support and in particular the establishment of discipline-based CoP.

Getting staff buy-in and support and making it relevant to them emerges as a key issue, but also important is ensuring that there is a critical mass—of resources and of people—to support and sustain these types of initiatives. If this is not possible on an institutional level, partnership models at a national or international level are an alternative approach. Language and culture issues are also barriers to uptake and adoption. This was evident in particular in case studies which involved translation of materials such as UnisulVirtual, who had to hire staff to translate the OER and to discuss them with lecturers, for adaptation and localisation purposes. This has also been cited as an issue in Turkey, where the number of new universities has doubled since 2003 and there is recognition of the value and role of OER, but only if they are available in Turkish. The AVO project aims to strengthen the production of open content through the development of high-quality materials by training and networking experts.

Business Models and Sustainability Strategies

An ongoing critical discourse about the open educational resources movement is the issue of how it can be made sustainable in the longer term and what business models might be appropriate. Untangling which models are actually being used in practice is complex, as a number of models might be used in conjunction and projects may change the basis of their business model over time. For example, it is common for projects to start through some funding initiative and then to move to an alternative model once that initial funding finishing.

Downes (2007) provides a useful categorisation of funding models for open-source-type initiatives: endowment models (where the project obtains base funding), membership models (where a coalition is invited to contribute a sum), donation models (where requests are made for donations), conversion models (where initial freely made material ultimately leads to some element of paying consumer), contributor-pay models (where the contributor pays for the cost of maintaining the contribution and the provider makes it freely available), sponsorship models (such as commercial advertising), institutional models (where the institution assumes responsibility for the initiative), government models (direct funding via government agencies) and partnership or exchanges (where the focus is on exchanging resources).

In the case studies reviewed, a mixture of these models was evident. For example, OpenLearn initially fitted the endowment model through funding from the Hewlett Foundation but is now supported internally and hence fits under the institutional model primarily. However, because of the ongoing range of spin-off initiatives and partnerships, it could also be considered to fit in with a number of the other models to some degree as well (endowment, conversion and partnership).

All of the case studies under the JISC/HEA OER programme are essentially a mix of endowment and institution, as although they are receiving funding for the work, there is a requirement that there is institutional support and ongoing commitment to the work. The business model of UnisulVirtual was one of 'independent investment'; that is, they did not use public funding money to promote their OER initiative but used university funds to implement it. Their aim was to mainstream OER into their usual university practices. However, their model of making material available via OpenLearn supported through local paid tutors is an example of institutional investment. BCcampus could be argued to be a mix of a government model (as it received government aid) but also fits under the partnership model.

The lack of clarity of individual business models is perhaps not surprising, as in reality projects will probably adopt a number of strategies in conjunction. For example, many initiatives have reported that making some of their educational resources freely available has lead to direct revenue returns in terms of learners then signing up for paid courses (hence an example of the conversion model). Furthermore, many of the pioneering early flagship OER projects now boast a range of spin-out initiatives, consultancy work and related research projects. Encouragingly, there seems to be a general recognition of and commitment to OER work as is evident in the number of institutions who are prepared to sign up for some element at least of the institutional model.

Barriers and Enablers

Many of the projects have incorporated formal evaluation mechanisms and so have been able to document both the barriers and enablers to the uptake and adoption of OER. Some of the barriers and enablers are technical (for example a lack of interoperability between platforms), but others are more to do with cultural or organisational issues.

For example, in some instances, there is evidence of users accessing OER but not repurposing them. A commonly cited barrier is academics' reluctance to provide resources under a Creative Commons share-alike licence. And more generally academics have often been slow to see the benefit of OER and have been concerned about the investment in time needed for the creation and use of OER. A significant issue is the lack of experience of using Web 2.0 technologies and given that most OER are delivered and repurposed this way, this is potentially a significant barrier.

The Pocket project[76] aimed to explore the issues that inhibit users from downloading, uploading and repurposing material from OpenLearn. The project identified a number of barriers to transformation and made recommendations for improvement (McAndrew and Wilson 2008).

As a means of overcoming barriers caused where Internet access is slow or expensive, the eGranary project[77] set up mirror sites for OER. A good example of a project that has attempted to address users' self-motivation is the Westminster University case study,[78] where they used multimedia training videos as a means of promoting their OER and exploring the potential that Web 2.0 tools have to offer as pedagogical tools. An alternative strategy is to see the OER work as part of a broader family of e-learning initiatives within an institution. MatheVital is perceived as successful because it augments other e-learning activities.

Open.fi adopts a different approach to getting teacher engagement. In addition to its core offering, that is, the digital learning materials, the portal offers a wide variety of materials for supporting learning and teaching; it organised competitions and theme days (such as the European Spring 2010, intellectual property rights day) and includes links to European sites such as eTwinning.

The collaborative approach adopted by the eLibrary project (involving eLibrary volunteers, students, scientists and employees) is stated as being a great motivator and helps teach the stakeholders involved to work in teams and gives them experience of using new technologies.

Enhancing the Quality and Innovation of OER

Part of the vision behind a clearer articulation of OEP is the notion that this may lead to improvements in the quality of and innovative development and use of OER. Each OER project has a particular story to tell about its inception and creation, as well as the mechanisms used for ensuring good practice and possible future developments. Capturing this diverse practice enables us to build a picture of current issues and should lead to a greater understanding of how OER can be created, developed and used in a variety of settings. Lessons of what works and what does not are

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[76] http://www.derby.ac.uk/pocket

[77] http://en.wikipedia.org/wiki/EGranary_Digital_Library

[78] http://www.heacademy.ac.uk/ourwork/teachingandlearning/alldisplay?type=projectsandnewid=oer/OER_IND_Westminsterandsite=york

essential to the further development of quality OER, as well as their wider adoption in the educational community. Determining the perceived quality of existing OER and understanding any innovative methods used to create them can also help forthcoming developments in the wider area of education, where the OER practice may or may not take place. The evidence from the case studies described in this chapter shows that different communities have developed a diverse collection of OER and have demonstrated a variety of good educational work.

OEP can take different forms: focusing on geographical coverage, exploitation of different types of networking technologies and mechanisms for sharing, exploration of cultural or language issues such as the choice of language medium, as well as the actual scale of OER production, delivery and support. Innovation can emerge during the development of OER and OEP as a result of perceived needs, the individual circumstances of the developers: experience, timeframe and available resources. It may be a reaction to these factors or simply transpire as a result of the local conditions and perceived OER status.

The initial eight OEP dimensions, identified by the OPAL project, were validated through a variety of forums, both online and virtual, between May 2010 and December 2010. This consultation with experts resulted in a refinement of the dimensions to four: strategies and policies, tools and tool practises, staff development and support, and barriers and success factors. These were then used as a basis for developing three guidelines, for learners, practitioners and institutional managers. The guidelines are intended to be used as a mechanism for each of these stakeholders to first benchmark their current position in terms of OEP and then enable them to develop a vision and implementation plan for enhancing their OEP. The guidelines are available online from the OPAL website.[79]

Conclusion

The description of the OLnet and OPAL initiatives outlined in this chapter shows how the OER research community is moving beyond the creation of OER repositories to more of a focus on and articulation of research into the use of OER and identification of emergent OER practices. In particular, I think the detailed abstraction of OER practices, undertaken as part of the OPAL initiative, has given us valuable insights and a richer understanding of how OER are being used. This provides a solid foundation for translating this understanding to provide more support and guidance for learners and teachers to effectively use OER. It is hoped that initiatives such as OPAL and OLnet will help address the initial issue discussed at the beginning of this chapter, namely, the lack of uptake and use of OER by the learning and teaching community.

[79] http://oer-quality.org/

References

Alevizou, P., Conole, G., & Galley, R. (2010). *Using Cloudworks to support OER activities, An HE Academy commissioned report*. Milton Keynes: The Open University.

Borgeman, C. L., Abelson, H., Dirks, L., Johnson, R., Koedinger, K., Linn, M. C., Lynch, C. A., Oblinger, D. G., Pea, R. D., Salen, K., Smith, M., & Azalay, A. (2008). *Fostering learning in the networked world: the cyberlearning opportunity and challenge*. Report of the NSF task force on cyberlearning. Available online at http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf. Accessed 7 Oct 2011.

Conole, G., & Culver, J. (2009). Cloudworks: Social networking for learning design. *Australasian Journal of Educational Technology (AJET) 25(5)*, 763–782. Available online at http://www.ascilite.org.au/ajet/ajet25/conole.html. Accessed 7 Oct 2011.

Conole, G., & Culver, J. (2010). The design of Cloudworks: Applying social networking practice to foster the exchange of learning and teaching ideas and designs. *Computers in Education, 54*(3), 679–692.

Conole, G., & McAndrew, P. (2010). A new approach to supporting the design and use of OER: Harnessing the power of Web 2.0. In M. Ebner & M. Schiefner (Eds.), *Looking toward the future of technology enhanced education: Ubiquitous learning and the digital nature*. Hershey: IGI Global.

Conole, G., Brasher, A., Cross, S., Weller, M., Clark, P., & White, J. (2008). Visualising learning design to foster and support good practice and creativity. *Educational Media International, 45*(3), 177–194.

Conole, G., McAndrew, P., & Dimitriadis, Y. (2010). The role of CSCL pedagogical patterns as mediating artefacts for repurposing Open Educational Resources. In F. Pozzi & D. Persico (Eds.), *Techniques for fostering collaboration in online learning communities: Theoretical and practical* (pp. 206–223). Hershey: IGI Global.

De Liddo, A., & Buckingham Shum, S. (2010). *Cohere: A prototype for contested collective intelligence*, Workshop: Collective intelligence in organizations – Toward a research agenda. Paper presented at the ACM Computer Supported Cooperative Work (CSCW 2010), Savannah, Georgia.

Downes, S. (2007). Models for sustainable open educational resources. *Interdisciplinary Journal of Knowledge and Learning Objects 3*, 29–44. Available online at http://ijklo.org/Volume3/IJKLOv3p029-044Downes.pdf. Accessed 7 Oct 2011.

Ehlers, U. D. (2011). *Open educational quality initiative – Midterm Report*. Essen: University of Duisburg-Essen.

Engeström, J. (2005). Why some social network services work and others don't — Or: The case for object-centered sociality %U http://www.zengestrom.com/blog/2005/04/why_some_social.html. Accessed 7 Oct 2011.

Engeström, J. (2007). Microblogging – Tiny social objects on the future of participatory media, cited in K. Anderson, blog entry June, 2007. http://strange.corante.com/archives/2007/06/13/nmkforum07_jyri_of_jaiku.php. Accessed 7 Oct 2011.

McAndrew, P. (2011, October 2–5). Adapting open educational resources: Lessons, issues and methods, ICDE conference, Bali. Available online at http://cloudworks.ac.uk/cloudscape/view/1642. Accessed 7 Oct 2011.

McAndrew, P., & Thille, C. (2009). *Proposal to the William and Flora Hewlett foundation to establish the Olnet initiative*. Milton Keynes: The Open University.

McAndrew, P., & Wilson, T. (2008). *Pocketing the difference: joint development of Open Educational Resources*. Paper presented at the Advanced Learning Technologys, ICALT 2008, Eighth international conference on advanced learning technologies, Santander.

McAndrew, P., Santos, A., Lane, A., Godwin, S., Okada, A., Wilson, T., Connolly, T., Ferreira, G., Buckingham Shum, S., Bretts, J., & Webb, R. (2009). *OpenLearn research report 2006–2008*. Milton Keynes: The Open University.

Nakki, P., Back, A., Ropponen, T., Kronqvist, J., Hintikka, K. A., Harju, A., Poyhtari, R., & Kola, P. (2011). Social media for citizen participation – Report on the Somus project, http://www.vtt.fi/inf/pdf/publications/2011/P755.pdf. Accessed 7 Oct 2011.

OPAL. (2010). *D3.1: Desk research and case study identification*. OPAL project report. Available online at http://oer-quality.org/. Accessed 7 Oct 2011.

Thompson, G. F. (n.d.). Fordism, post-fordism and the flexible system of production. From http://www2.cddc.vt.edu/digitalfordism/fordism_materials/thompson.htm. Accessed 11 Aug 2012.

Wenger, E. (1998). *Communities of practice. learning, meaning and identity. Learning in doing: Social, cognitive, and computational perspectives*. Cambridge: Cambridge University Press.

Chapter 14
Online Communities and Interactions

Introduction

As discussed elsewhere in this book, there has been a shift in the nature of the Web and the way it is used from an essentially static Web 1.0 to a more participatory and interactive Web 2.0 (O'Reilly 2004, 2005). Chapter 4 described the new forms of open, social and participatory media and their associated characteristics. Clearly these have immense potential for learning and teaching (Anderson 2007; Downes 2005). This chapter will explore this theme in more depth and in particular look at the nature of online communities and interactions. It will argue that new forms of more distributed, loose communities are emerging, which require new ways of describing and evaluating them. The chapter describes some of the most common e-learning pedagogies and looks at examples of how technologies can be used to instantiate these. The chapter will introduce a Community Indicator Framework (CIF) that we have developed to design and evaluate online spaces and to understand emergent user behaviour in them. The chapter will explore the range of user interactions that are now evident in such online spaces, ranging from individual interactions with resources through to engagement with distributed networks and online communities. It argues that new approaches, such as the open learning design methodology introduced in this book, are needed if these online environments are going to be effective in supporting more participatory approaches to learning and teaching.

Mapping Technologies

Figure 14.1 maps technologies in terms of the degrees to which they support communication (with others) and interaction (with resources and tools). This is just a generalised mapping, as the positioning of any one technology will depend on how it is actually being used in a particular context. Static Web pages appear at the bottom left-hand corner, as they essentially do little more than display content.

G. Conole, *Designing for Learning in an Open World*, Explorations in the Learning Sciences, Instructional Systems and Performance Technologies 4,
DOI 10.1007/978-1-4419-8517-0_14,

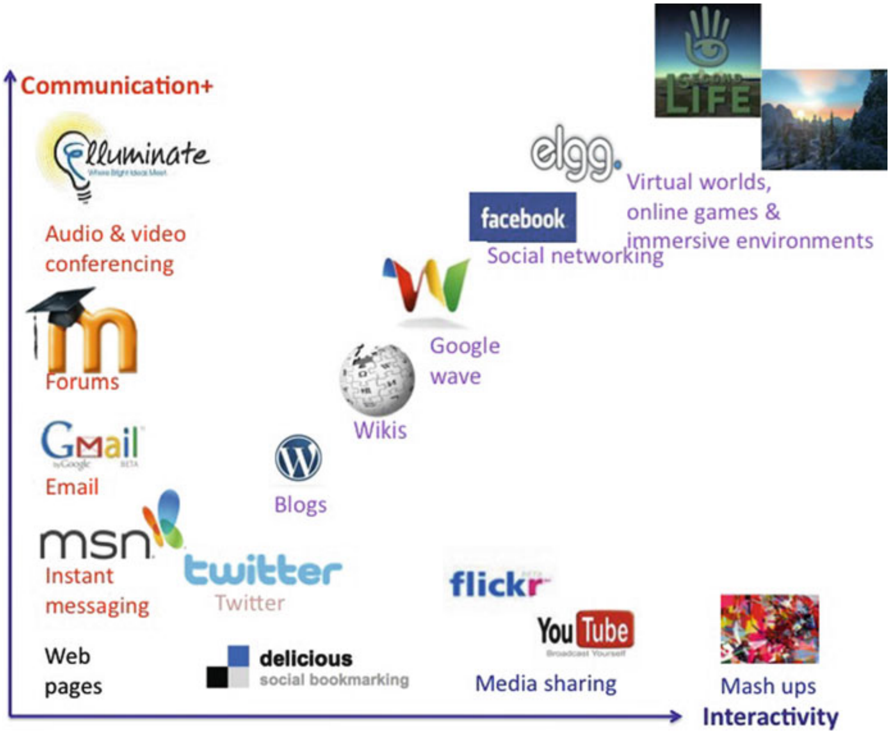

Fig. 14.1 A map of technologies against communication and interaction

Instant messaging, email, forums and audio/video conferencing offer increasingly rich environments for communication with others. Recently developed virtual presence conferencing tools arguably offer the richest environment for communication. Along the interaction axis, in order of increasing richness, are placed social bookmarking sites, media sharing repositories and mash-up tools. Diagonally we can place microblogging sites like Twitter, blogs, wikis, social networking sites, virtual worlds and online gaming sites.

Table 14.1[1] describes the key characteristics of different pedagogical approaches, along with examples of e-learning applications. Conole (2010) discusses these in more detail and described a range of pedagogical frameworks and models that have been developed across these. Examples include Merrill's instructional design principles discussed in Chapter 3 (Merrill 2002; Merrill 2009), Laurillard's conversational framework (Laurillard 2002), Salmon's e-moderating framework (Salmon 2003) and Jonassen et al.'s constructivist framework (Jonassen 2005; Jonassen et al. 1999). These frameworks have proved useful in terms of enabling teachers to design

[1] Adapted from Conole (2010).

Table 14.1 The characteristics of different pedagogical approaches and associated e-learning applications

Perspective	Approach	Characteristics	E-learning application
Associative	Behaviourism	Focuses on behaviour modification, via stimulus-response pairs	Content delivery plus interactivity linked directly to assessment and feedback
	Instructional design	Controlled and adaptive response and observable outcomes	
	Intelligent tutoring	Learning through association and reinforcement	
	Didactic learning		
	E-training		
Cognitive	Constructivism	Learning as transformation in internal cognitive structures	Development of intelligent learning systems and personalised agents
	Constructionism	Learners build their own mental structures	Structured learning environments, such as simulated worlds
	Reflective learning	Task-orientated, self-directed activities	Support systems that guide users
	Problem-based learning	Language as a tool for joint construction of knowledge	Access to resources and expertise to develop more engaging active, authentic learning environments
	Inquiry learning	Learning as the transformation of experience into knowledge, skills, attitudes, values and emotions	Asynchronous and synchronous tools that offer the potential for richer forms of dialogue/interaction
	Dialogic learning		Use of archive resources for vicarious learning
	Experiential learning		
Situative	Cognitive apprenticeship	Taking social interactions into account	New forms of distribution archiving and retrieval offer the potential for shared knowledge banks
	Case-based learning	Learning as social participation, within a wider sociocultural context of rules and community	Adaptation in response to both discursive and active feedback
	Scenario-based learning		Emphasis on social learning and communication/collaboration
	Vicarious learning		Access to expertise
	Collaborative learning		Potential for new forms of communities of practice or enhancing existing communities
	Social constructionism		
Assessment		Focus is on feedback and assessment (internal reflection on learning and also diagnostic, formative and summative assessment)	E-learning applications range from in-text interactive questions through multiple-choice questions up to sophisticated automatic text marking systems
Generic		Do not align to any particular pedagogical perspective but provide a useful overview	Often translated into underpinning ontologies or learning systems architectures

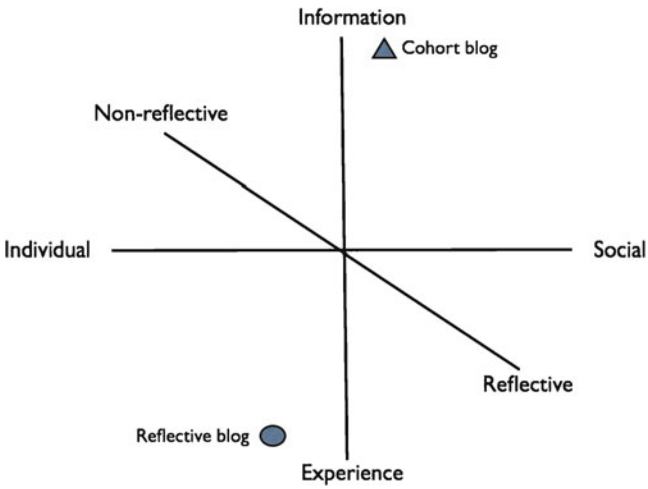

Fig. 14.2 The 3D pedagogical framework

learning interventions based on particular pedagogical approaches. Each approach foregrounds particular aspects of learning (e.g. reflection, dialogue, collaboration, etc.). As discussed in Chapter 8, Conole et al. (2004) carried out a review of learning theories and developed a 3D framework, which can be used to map both theories and individual learning activities (Fig. 14.2). The framework argues that any learning can be mapped along three dimensions:

- Individual learning–social learning: where social learning refers to learning through communication and collaboration with tutors and peer learners.
- Reflection–non-reflection: where reflection refers to conscious reflection on experience and non-reflection refers to processes such as conditioning, preconscious learning, skills learning and memorisation.
- Information–experience: learning can be acquired through text and other knowledge artefacts or learning arises through direct experience, activity and practical application.

This can be used to map the use of technologies in different learning contexts against the three dimensions. So, for example, the use of a blog by an individual learner to reflect on their learning might be considered to be nearer the individual end, high on the reflection end and nearer to experience than information. In contrast, a cohort blog used by learners to collectively aggregate relevant references and resources for their course would be nearer to the social end, the information end and the non-reflection end.

Building on this, Dyke et al. (2007) argue that e-learning developments could be improved if they were orientated around three core elements of learning: through thinking and reflection, from experience and activity, and through conversation and interaction. These three aspects are interwoven across many of the commonly used categorisations of learning approaches. Dyke et al. (2007) contend that:

> designing for effective learning should make explicit which components are foregrounded in different learning activities. By considering the mapping of a particular learning scenario against the three dimensions ('information–experience', 'reflection–non-reflection' and 'individual–social') the practitioner can see which pedagogical theories best support the activity depending on where it lies along each dimension.

Modes of Interaction

Writing before the emergence of social and participatory media, Anderson argued that interaction is a complex and multifaceted concept (Anderson 2003, p. 129). Arguably that is truer now than ever before; learners and teachers are able to interact and communicate in a rich plethora of ways through the use of social and participatory media. Moore identifies three forms of interaction in distance education: interaction between students and teachers, students and students, and students and content (Moore 1989). To these, Hillman et al. (1994) added a fourth, learner interface. This is the interaction that takes place between the learner and the technology. Learners can use the technology to interact with content, the instructor and other learners. Web 2.0 tools provide a range of mechanisms for supporting these different types of interactions. In particular, these tools can support both interaction between the student and content and social interaction between students and students, and students and teachers. Mcylopedia defined social interaction as the extent to which a highly collaborative and interactive environment is provided in which students can communicate (Mcylopedia, n.d.).

Siemens provides a useful overview of the nature of interaction in online learning spaces (Siemens 2002). He argues that interaction is essential for effective learning and identifies the following as important aspects of interaction:

- It can be grouped by type of interaction (human-human, human-computer, computer-computer).
- Time (synchronous or asynchronous), the number of people and the location (proximate or at a distance) all influence the nature of the interaction.
- The types of interactions need to relate to the nature of activities to be supported.
- Different degrees of interaction are possible.

He quoted Wagner's definition of interaction (Wagner 1994):

> Interactions occur when these objects and events mutually influence one another. An instructional interaction is an event that takes place between a learner and the learner's environment. Its purpose is to respond to the learner in a way intended to change his or her behavior toward an educational goal. Instructional interactions have two purposes: to change learners and to move them toward achieving their goals.

Sutton (1999) argues that new technologies have allowed for increasing interaction between and amongst learners and instructors. She suggests that the interaction between the learner and the content is the most basic of the four types of interaction. Learner-instructor interaction can vary from the instructor making a presentation to a group of students, through to them interacting one-to-one with a student.

The Changing Nature of Online Communities

Galley et al. (2012) argue that the notion of community in the context of new social and participatory media is complex and nebulous. They suggest that the notion of 'communities' in social and participatory spaces is different and argue that:

> Participatory Web processes and practices have more recently opened up new spaces for, and styles of, interaction - social spaces which enable transient, collaborative, knowledge building communities, and the development of shared assets such as interests, goals, content and ideas.

Communities differ in their degree of cohesiveness but form around shared interests, intent, beliefs, resources, etc., and some sense of shared identity and belonging. McMillan and Chavis identify four elements associated with communities: (1) membership, (2) influence, (3) integration and fulfilment of needs and (4) shared emotional connection (McMillan and Chavis 1986). Putnam refers to the sense of connectedness and formation of social networks as 'social capital' (Putnam 2000). Cohen, in looking at the nature of belonging and attachment, talks about 'communities of meaning'. In other words, 'people construct community symbolically, making it a resource and repository of meaning, and a referent of their identity' (Cohen 1985, p. 118).

Dron and Anderson (2007) describe three related terms: 'groups', 'networks' and 'collectives'. They consider the degree to which they are present in online spaces and how various tools can be used to support them. They define 'groups' as being focused around formal lines of authority and roles that are often structured around particular tasks. Networks are looser than groups; they connect distributed individuals and enable members to identify and communicate with others with shared interests. They are fluid and generative, and individuals are often members of a number of networks. Collectives are aggregations around individuals, who do not see themselves as part of a group or network.

Referring specifically to education, the community of inquiry (CoI) model identifies the three interrelated elements that are needed to support online learning and teaching: social presence (i.e. the ability to identify with the community), teaching presence (i.e. the design, facilitation and direction of the learning) and cognitive presence (i.e. the construction of meaning through reflection and discourse) (Garrison et al. 2000; Garrison 2003). The framework is often used as a basis to derive coding templates for analysis of online discussions, used to develop student evaluations of learning contexts (Arbaugh et al. 2008).

Referring to the 'bodies of knowledge' around different types of professional practice, Wenger states that 'from a social perspective I see the real "body of knowledge" as a community of people who contribute to the continued vitality, application, and evolution of the practice' (Wenger 2001). Lave and Wenger (1991, 1998; Wenger 1998) introduced the concept of communities of practice (CoP):

> Communities of Practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.

The AeP.2 project[2] defines a community of practice as the 'informal aggregation of individuals drawn together by common interests'. The communities of practice concept is very much an example of a socially situated theory of learning, where learning is seen as social participation. It consists of four aspects: learning as community, learning as identity, learning as meaning and learning as practice. Wenger's theory is valuable in that it considers the ways in which communities of practice are formed and developed; notions of trajectories of belonging, legitimate participation and boundary objects/crossings have provided useful lenses to describe many interactions observed in online spaces. Key characteristics of a community include a shared domain of interest, engagement in joint activities and discussions, and practice (a shared repertoire of experiences). They can be tight-knit and small or loosely connected and large. Technologies can support communities in a number of ways: by providing asynchronous and synchronous shared discussion spaces (both open and closed), a facility to share resources and links and a directory of members showing their expertise and interests (Wenger 2001). Corso et al. observe five distinct stages of community development: potential, coalescing, maturing, stewardship and transformation (Corso et al. 2008).

Aggregations of communities of practice are defined by Fischer (2001) as communities of interest (CoI), which bring together individuals from different communities of practice to solve a problem of shared concern, and they are often more temporary than CoP. Seely Brown and Duguid (2000) defined a related term, networks of practice (NoP), which refers to the overall set of various types of informal, emergent social networks that facilitate information exchange between individuals with practice-related goals. Networks of practice range from communities of practice (where learning occurs) to electronic networks of practice (often referred to as virtual or electronic communities).

Social network analysis (SNA) is a useful analytic tool for visualising networks and connections between people (see Hawthornthwaite 2002 for a discussion of the use of SNA in an online learning context). A social network (Wittel 2001) is defined as a social structure made up of individuals connected together through some form of interdependency.

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[2] http://www.eportfoliopractice.qut.edu.au/

Arguably participation in these online spaces constitutes what Jenkins et al. refer to as participatory culture (Jenkins et al. 2006; Jenkins 2009), which is defined as having (1) relatively low barriers to artistic expression and civic engagement, (2) strong support for creating and sharing one's creations with others, (3) some type of informal mentorship whereby what is known by the most experienced is passed on to novices, (4) where members believe that their contribution matters and (5) where members feel some degree of social connection with one another. As discussed elsewhere in this book, Jenkins (2009) suggests that a new set of digital literacies are needed to make effective use of these new technologies. They go on to argue that we should take an ecological approach to thinking about the different communication technologies that can be used, the cultural communities that grow up around them and the activities they support. He suggests that these new participatory cultures are ideal learning environments and references Gee's work on 'affinity spaces' where people learn through active participation (Gee 2004). They are characterised by common endeavours, and they depend on peer-to-peer teaching.

The Pedagogies of E-learning

A number of publications have considered the pedagogies of e-learning (Conole et al. 2004; Dyke et al. 2007; Mayes and Freitas 2004; Ravenscroft 2004). Table 14.1 looked at the characteristics of different pedagogical approaches and associated e-learning applications. This section provides a summary of the different types of pedagogies, associated pedagogical approaches and examples of their application in an e-learning context.

Before discussing the pedagogies, it is first worth reflecting on what learning is. Aristotle argued that 'thought by itself, however, moves nothing, what moves us is thought aiming at some goal and concerned with action' (cited in Irwin 1985). Jarvis argues that 'human learning… whole persons construct experiences of situation and transform them into knowledge, skills, attitudes, values, emotions and the senses, and integrate the outcomes into their own biographies' (Jarvis 2004). Finally, Laurillard argues that 'knowledge is information already transformed: selected, analysed, interpreted, integrated, articulated, tested, evaluated' (Laurillard 2002). Therefore, a key component of learning is about transformation of experience. Learning is both individual and contextually located, with each learner building on their prior experience.

Mayes and De Freitas (2004) group learning theories into three categories:

- Associative: learning as an activity through structured tasks, where the focus is on the individual, with learning through association and reinforcement
- Cognitive/constructivist: learning through understanding, building on prior knowledge, which is often task orientated
- Situative: learning as social practice and learning through social interaction in context

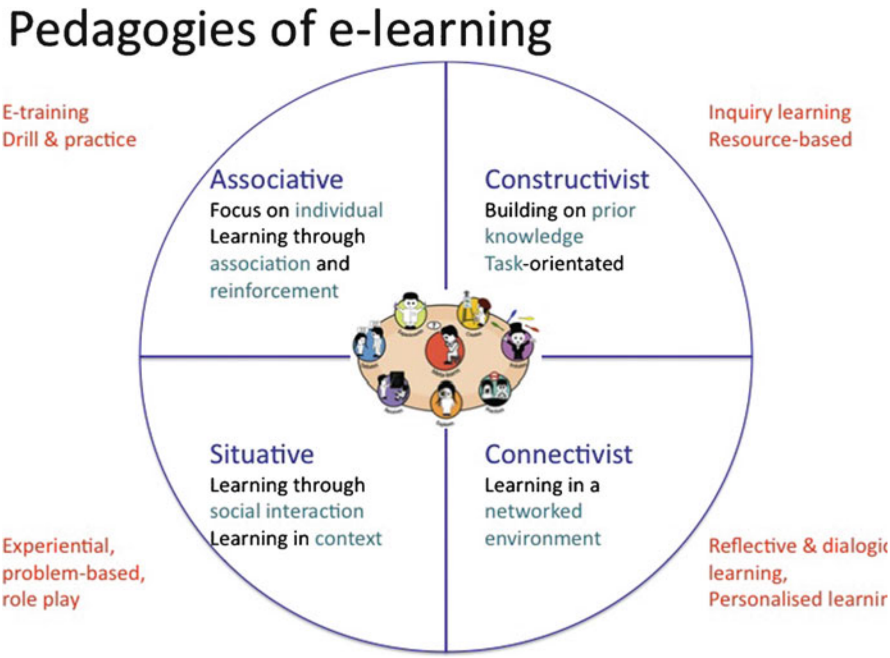

Fig. 14.3 The pedagogies of e-learning

Each of these has a number of approaches associated with it, which emphasise different types of learning (Fig. 14.3). For example, the associative category includes behaviourism and didactic approaches. The cognitive/constructivist category includes constructivism (building on prior knowledge) and constructionism (learning by doing). Finally, the situative category includes social constructivism and situated learning. At a finer level of detail, it is possible to identify a number of approaches within the three perspectives. For example, the associative category includes drill and practice and e-assessment. The cognitive perspective includes a range of approaches to learning such as problem-based learning, inquiry-based learning and resource-based learning. Finally, the situative perspective includes experiential learning, problem-based learning and role play. To these three categories, I would like to add a fourth, connectivism, which relates to learning in a networked context (Downes 2007; Siemens 2005). Connectivism is particularly useful for supporting reflective, dialogic and personalised learning.

Conole et al. reviewed learning theories and mapped them against a pedagogical framework (Conole et al. 2004). Dyke et al. (2004) built on this work by providing an overview of the main learning theory perspectives along with an indication of the kinds of e-learning practice they most obviously support. Ravenscroft (2004) linked learning pedagogical theory to specific examples of e-learning innovation. Figure 14.4 gives some examples of how technologies can be used to promote each of the pedagogical approaches.

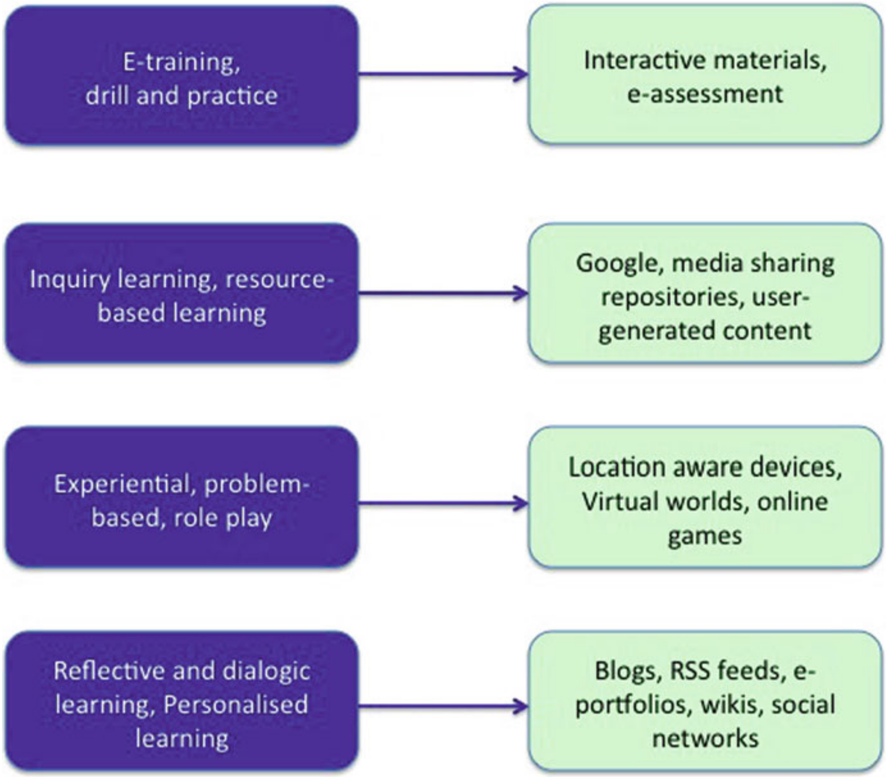

Fig. 14.4 Mapping different technologies to pedagogical approaches

Interactive materials and multimedia have been used since the early days of educational technology to guide learners step by step through a series of concepts and activities. This has been particularly important in an e-training context. These can be packaged and made available as learning objects or open educational resources (OER). McNaught describes the ChemCal online interactive materials developed in the 1990s (McNaught 2010). It included interactivity, different levels of help, use of visual materials and little in the way of didactic materials. The OpenMark software[3] developed by the Open University, UK, provides a sophisticated environment for e-assessment. There are numerous types of questions ranging from simple multiple-choice questions through to more open-ended question types. Butcher cites the following benefits of OpenMark: There is an emphasis on feedback, it provides the ability for the learner to do multiple attempts, and a breadth of interactions are supported (Butcher 2008). The emergence of new mobile technologies such as the

[3] http://www.open.ac.uk/openmarkexamples/

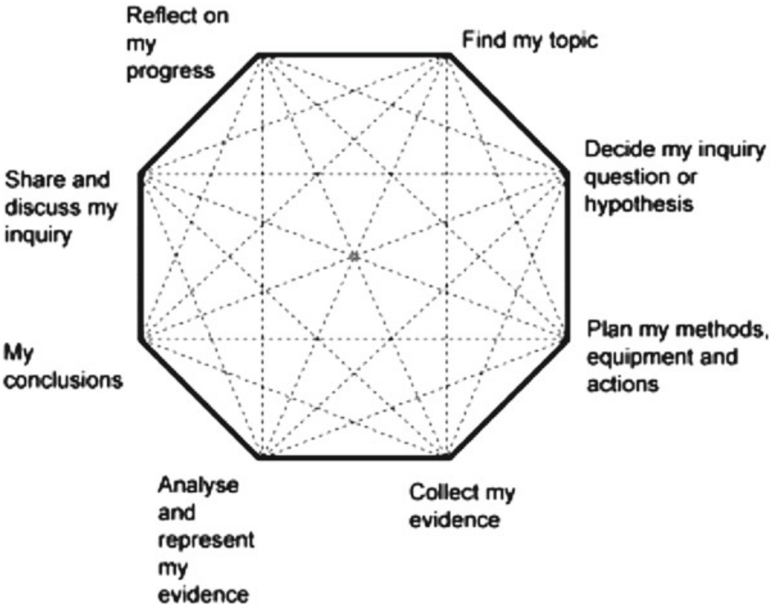

Fig. 14.5 The PI inquiry-based framework

iPhone and iPad means that learners can now study anywhere, anytime. In the last couple of years, there has been an explosion of learning applications developed for these platforms. In addition, many institutions are now looking at ensuring their learning materials can be displayed on mobile devices. For example, at the Open University, UK, the study calendar (which is a core part of OU modules) can now be displayed on mobile devices.

Search engines, like Google; media sharing repositories (such as Flickr, SlideShare and YouTube) and tools for creating user-generated content can all be used to support inquiry-based and resource-based learning. One of the particular benefits of this is that it supports more learner-centred, constructivist approaches. The Personal Inquiry project[4] was concerned with using technologies to help learners adopt inquiry-based learning approaches in science learning. Following an extensive review of the literature (Scanlon et al. 2012), an inquiry-based framework was developed, which articulated the key stages of inquiry-based learning (Fig. 14.5). This was used to underpin an online toolkit, nQuire.[5]

In terms of resource-based learning, there are now an expansive range of open educational resource repositories (see Chapter 11 for a more detailed discussion of OER). Related to this, there is also a wealth of learning object repositories, although

[4] http://www.pi-project.ac.uk/

[5] http://www.nquire.org.uk/

not all of these are freely available. The Reusable Learning Objects project created a tool (GLO Maker)[6] to help users create learning objects. Finally, many institutions are now using podcasts and vidcasts, often making them available in the iTunes U site.[7]

There are now many examples of how location-aware devices, virtual worlds and online games can be used to support experiential learning, problem-based learning and role play. Second Life in particular has been used extensively. Examples include virtual archaeological digs, medical wards, art exhibitions, law courts and virtual language exchange islands. Wills et al. provide a comprehensive review of the use of technology to support role-based learning (Wills et al. 2010).

Reflective and dialogic learning can be supported in a variety of ways, for example, through the use of blogs and e-portfolios to support personal reflection and professional practice (O'Donoghue 2010; Stefani et al. 2007), group-based blogs for shared understanding, use of wikis for collaboration and project-based work (Godwin-Jones 2003), social bookmarking for aggregation of resources (McLoughlin and Lee 2007) and microblogging sites such as Twitter for just-in-time learning.[8] Collectively Web 2.0 tools can be used to connect learners to resources and expertise beyond the confines of formal courses (Hatzipanagos and Warburton 2009; Mason and Rennie 2008).

Sfard's Metaphors of Learning

This section will introduce Sfard's (1998) work on metaphors of learning, considering the ways in which new technologies are supporting these through different types of interaction and community in online environments. She argues that the current discourse in learning is caught between two metaphors: acquisition and participation. Definitions of learning usually contain something about the act of gaining knowledge. Concepts are basic units of knowledge that can be gradually accumulated, refined and combined to form richer cognitive structures. Participation is about both taking part and being a part of a community of learners. The acquisition metaphor stresses the individual, whilst the participation metaphor shifts the focus to the evolving bonds between the individual and others. Sfard articulates the difference between the two metaphors as outlined in Table 14.2.[9]

She argues that the participation metaphor has the potential to lead to a new, more democratic practice of learning and teaching. This resonates well with the affordances[10] of new social and participatory media, which facilitate new forms of

[6] http://www.glomaker.org/

[7] http://www.apple.com/education/itunes-u/

[8] http://elearningtech.blogspot.com/2010/03/twitter-for-learning-55-great-articles.html

[9] Adapted from Sfard (1998)

[10] This is discussed in more detail in Chapter 6.

Table 14.2 Sfard's metaphor map

	Acquisition metaphor	Participation metaphor
Goal of learning	Individual enrichment	Community building
Learning	Acquisition of something	Becoming a participant
Student	Recipient (consumer), (re)constructor	Peripheral participant, apprentice
Teacher	Provider, facilitator, mediator	Expert participant, preserve of practice/discourse
Knowledge, concept	Property, possession, commodity (individual, public)	Aspect of practice/discourse/activity
Knowing	Having, possessing	Belonging, participating, communicating

discourse and collaboration, sharing and open practices. Clearly social and participatory media can be used to support both forms of learning, by providing multiple distribution channels for content and enabling learners and teachers to communicate and collaborate in a variety of ways.

Frameworks for Supporting Online Communities

A number of frameworks have been developed to design, foster and support online communities. Two illustrative examples are given here: Salmon's five-stage e-moderating framework and Preece's online community framework.

A specific e-learning model that describes the stages of increasing competence in participating in an online learning community for supporting effective e-moderating in discussion forums is Salmon's five-stage framework, which emphasises the dialogic aspects of socially situated theoretical perspectives (Salmon 2003). The five stages are:

- Access and motivation
- Online socialisation
- Information exchange
- Knowledge construction
- Development

This can be represented diagrammatically (Fig. 14.6).[11] In addition, Salmon has reproduced a range of suggested e-activities to promote effective online communication (Salmon 2004). As the learner progresses through the levels, there is an increasing degree of engagement and competence in interacting in the online space. The framework can be used to guide the design and support of such online spaces for learning.

[11] Screenshot from http://www.atimod.com/e-moderating/5stage.shtml

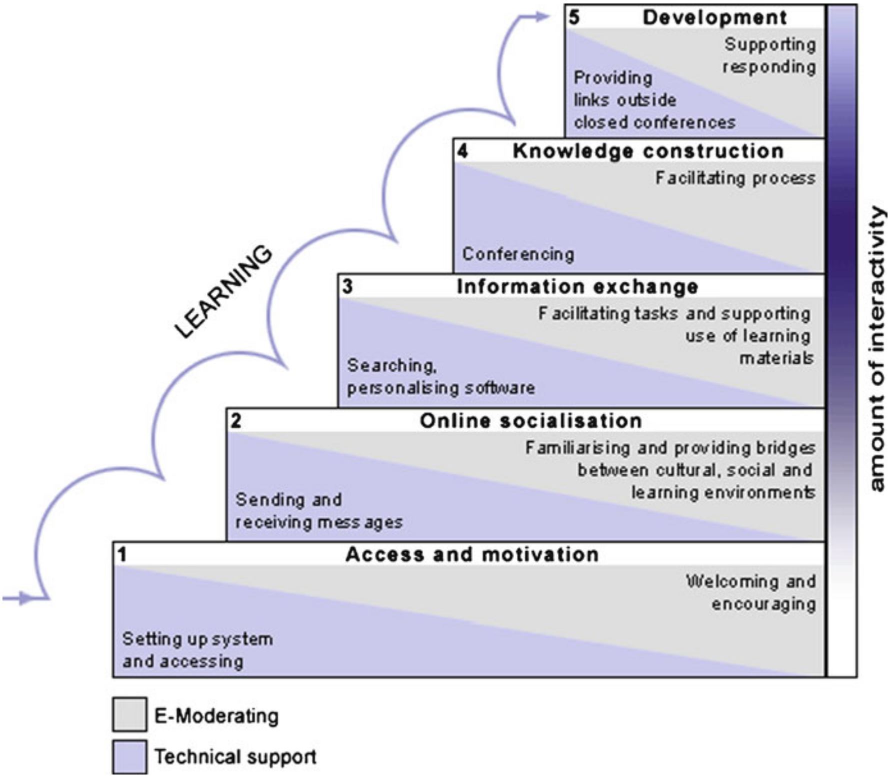

Fig. 14.6 The e-moderating model

Table 14.3 An abridged version of Preece's framework

Dimensions	Design criteria	Determinants of success
Sociability	Purpose	Types of messages and comments, types of interactivity, quality of contributions
	People	Who is participating?
	Policy	What policies are in place?
Usability	Dialogue and social support	How long does it take to learn about dialogue and support?
	Information design	How long does it take to learn to find information?
	Navigation	How long does it take to navigate around?
	Access	Can users get access to everything they need?

Preece has developed a framework for establishing and supporting online communities, which focuses around two key dimensions—sociability and usability (Preece 2000, 2001). These can then be considered in terms of a number of design criteria and associated determinants of success (Table 14.3).

The Community Indicator Framework (CIF)

We have developed a community indicator framework (CIF) for evaluating online interactions and communities (Galley 2010; Galley et al. 2012). Figure 14.7 shows the main components of the framework. This was developed after undertaking an extensive review of the literature on online interactions and communities (Galley 2010). From this review, we identified four community indicators, which appear to be common across the various frameworks described above, namely, participation, cohesion, identity and creative capability. Participation and patterns of participation relate to the fact that communities develop through social and work activity over time. Participants can adopt a legitimate peripheral participation (Wenger 1998) stance or be central to the community in question. Different roles are evident such as leadership, facilitation, support and passive involvement. Cohesion relates to the way in which members of a community support each other through social interaction and reciprocity. Identity relates to the group's developing self-awareness and in particular the notion of belonging and connection. Creative capability relates to how far the community is motivated and able in engaging in participatory activity. Galley et al. (2012) provide a more detailed account of the rationale for the

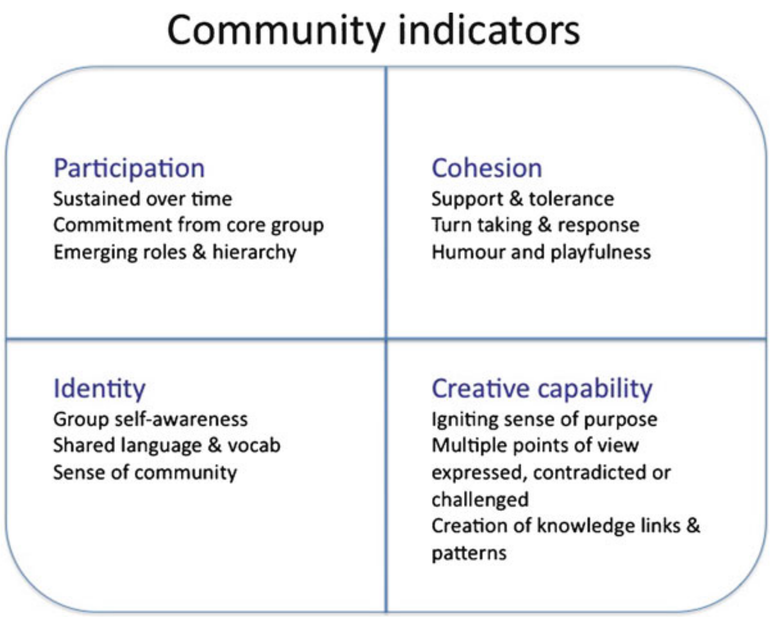

Fig. 14.7 The community indicator framework (Galley et al. 2010)

development of the framework and a description of its use to evaluate the social networking site Cloudworks, which is discussed in the next chapter.[12]

The community indicator framework (CIF) provides a structure to support the design and evaluation of community building and facilitation in social and participatory media. To date we have used it in a series of case study evaluations (Alevizou et al. 2010; Galley et al. 2012). It is being used to inform the design of a series of guidance and support resources on the Cloudworks site (discussed in Chapter 15). We hope that the framework will offer a structured way to begin to analyse new and emerging open-participatory practices that will help us develop insights into future design needs of such online social networking sites.

Although not discussed here, the notions of connectivism developed by Siemens (2005) and later critiqued by Downes (2007) might also be useful in terms of describing online interactions and communities. Crucial is the notion that connectivism emphasises the fact that knowledge is distributed and that learning is the process of growing/pruning those networks and connections in a dynamic and evolving way over time.

Conclusion

This chapter has considered some of the key challenges in researching new learning contexts through socially mediated environments, namely, articulation and understanding of the nature of the interactions amongst users within these environments and between the users and the tools that form part of the environment. A range of frameworks for describing online interaction and community have been discussed in terms of the light they shed on patterns of user behaviour in online spaces. The chapter has demonstrated that these frameworks are indeed useful but only offer a partial solution. None of the frameworks provides a comprehensive holistic description. A new community indicator framework (CIF) was described which aims to provide a more holistic approach to understanding user behaviour in online spaces.

References

Alevizou, G., Conole, G., & Galley, R. (2010). *Using Cloudworks to support OER Activities*. Report for the HE Academy. Milton Keynes: The Open University.

Anderson, T. (2003). Modes of interaction in distance education: Recent developments and research questions. In M. G. Moore & W. G. Anderson (Eds.), *Handbook of distance education*. Mahwah: Lawrence Erlbaum Associates.

Anderson, P. (2007, February). What is web2.0? Ideas, technologies and implications for education. Citesser, JISC Technology. Standards watch. Available online at http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf. Accessed 11 Aug 2011.

[12] http://cloudworks.ac.uk

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., et al. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3–4), 1330136.

Butcher, P. (2008, July 8–9). *Online assessment at the Open University using open source software: Moodle, OpenMark and more*. Paper presented at the 12th International CAA Conference, Loughborough.

Cohen, A. P. (1985). *The symbolic construction of community*. London: Tavistock.

Conole, G. (2010). Review of pedagogical frameworks and models and their use in e-learning. Retrieved from http://cloudworks.ac.uk/cloud/view/2982. Accessed 11 Aug 2012.

Conole, G., Dyke, M., Oliver, M., & Seale, J. (2004, August–September). Mapping pedagogy and tools for effective learning design. *Computers in Education, 43*(1–2), 17–33.

Corso, M., Martini, A., & Balocco, R. (2008). Organising for continuous innovation: The community of practice approach. *International Journal of Technology Management, 44*(3/4), 441–460.

Downes, S. (2005). E-learning 2.0. *eLearn Magazine, 2005*(10). Available online at http://www.elearnmag.org/subpage.cfm?section=articlesandarticle=29-1. Accessed 7 Oct 2011.

Downes, S. (2007, June 25–26). *An introduction to connective knowledge*. Paper presented at the Media, Knowledge and Education – Exploring new Spaces, Relations and Dynamics in Digital Media Ecologies, Vienna.

Dron, J., & Anderson, T. (2007). *Collectives, networks and groups in social software for e-Learning*. Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education Quebec. Retrieved Feb (Vol. 16, pp. 2008).

Dyke, M., Conole, E., Ravenscroft, A., & de Freitas, S. (2007). Learning theories and their application to e-learning. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Theories, methods and impact on practice*. London: Routledge.

Dyke, M., Conole, G., Ravenscroft, A., & de Freitas, S. (2007). Learning theories and their application to e-learning. In G. Conole & M. Oliver (Eds.), *Contemporary perspectives in e-learning research: Theories, methods and impact on practice*. London: Routledge.

Fischer, G. (2001). *Communities of Interest: Learning through the interaction of multiple knowledge systems*. Paper presented at the 24th Annual Information Systems Seminar Ulvik, Norway.

Galley, R. (2010). *A framework of community indicators for online environments*. Milton Keynes: The Open University.

Galley, R., Conole, G., & Alevizou, P. (2012). Community indicators: A framework for building and evaluating community activity on Cloudworks. *Interactive Learning Environments*. (pp 1–23).

Garrison, D. R. (2003). *E-learning in the 21st century: A framework for research and practice*. London: Routledge.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105.

Gee, J. P. (2004). *Situated language and learning: A critique of traditional schooling*. New York: Routledge.

Godwin-Jones, R. (2003). Blogs and wikis: Environments for online collaboration. *Language learning and technology 7(2)*, 12–16. Available online at http://llt.msu.edu/vol7num2/emerging/default.html. Accessed 7 Oct 2011.

Hatzipanagos, S., & Warburton, S. (Eds.). (2009). *Handbook of research on social software and developing community ontologies*. Hershey: IGI.

Hawthornthwaite, C. (2002). Building social networks via computer networks: Creating and sustaining distributed learning communities. In K. A. Renninger & W. Shumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 159–190). Cambridge: Cambridge University Press.

Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education, 8*(2), 30–42.

Irwin, T. (1985). *Aristotle Nicomachean ethics*. Cambridge: Cambridge Hackett Publishing Company.
Jarvis, P. (2004). *Adult education and lifelong learning*. London: RoutledgeFalmer.
Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Boston: MIT Press.
Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st Century*, MacArthur commissioned report. Available online http://digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF. Accessed 7 Oct 2011.
Jonassen, D. H. (2005). Design of constructivist learning environments. Retrieved from http://www.coe.missouri.edu/%7Ejonassen/courses/CLE/index.html. Accessed 7 Oct 2011.
Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1999). *Learning to solve problems with technology: A constructivist perspective*. Upper Saddle River: Merrill Publishing.
Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.). London: RoutledgeFalmer.
Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
Lave, J., & Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.
Mason, R., & Rennie, F. (2008). *E-learning and social networking handbook: Resources for higher education*. Abingdon: Routledge.
Mayes, T., & De Freitas, S. (2004). *Review of e-learning frameworks, models and theories, JISC e-learning models desk study*. Available online at http://www.jisc.ac.uk/uploaded_documents/Stage%202%20Learning%20Models%20(Version%201).pdf. Accessed 7 Oct 2011.
McLoughlin, C., & Lee, M. (Eds.). (2007). *Social software and participatory learning: Pedagogical choices with technology affordances in a Web 2.0 era*. Proceedings of the ASCILITE conference, (pp. 664–675). Singapore. Available online at http://www.ascilite.org.au/conferences/singapore07/procs/mcloughlin.pdf. Accessed 7 Oct 2011.
McMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology, 14*, 6–23.
McNaught, C. (2010). *Enduring themes and new horizons for educational technology, keynote presentation*. Edmedia conference, Toronto, Canada, 28th June–2nd July 2010.
Mcylopedia. (n.d.). E-learning and social interaction. From http://wiki.media-culture.org.au/index.php/E-Learning_-_Social_Interaction. Accessed 7 Oct 2011.
Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development, 50*(3), 43–59.
Merrill, M. D. (2009). First principles of instruction. In C. M. Reigeluth & A. Carr-Chellman (Eds.), *Instructional design theories and models* (Vol. III). New York: Lawrence Erlbaum Associates.
Moore, M. (1989). Three types of interaction. *American Journal of Distance Education, 3*(2), 1–6.
O'Donoghue, J. (Ed.). (2010). *Technology-supported environments for personalized learning: Methods and case studies*. Hershey: IGI Global Publishers.
O'Reilly, T. (2004). The architecture of participation. http://www.oreillynet.com/pub/a/oreilly/tim/articles/architecture_of_participation.html. Accessed 7 Oct 2011.
O'Reilly, T. (2005). What is Web 2.0 – Design patterns and business models for the next generation of software. http://oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-Web-20.html. Accessed 7 Oct 2011.
Preece, J. (2000). *Online communities: Designing usability, supporting sociability*. Chichester: Wiley.
Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. *Information Technology Journal, 20*(5), 347–365.
Putnam, R. D. (2000). *Bowling along*. New York: Simon and Schuster.

Ravenscroft, A. (2004). From conditioning to learning communities: Implications of fifty years of research in e-learning interaction design. *ALT-J, 11*(3), 4–18.

Salmon, G. (2003). *E-moderating. The key to teaching and learning on line*. London: Kogan Page.

Salmon, G. (2004). *E-tivities – The key to active online learning*. London: Routledge.

Scanlon, E., Anastopoulou, S., Kerawalla, L., & Mulholland, P. (2012). How to use technology to represent and support students understanding of personal inquiry across contexts. *Journal of Computer Assisted Learning*.

Seely Brown, J., & Duguid, P. (2000). *The social life of information*. Boston: Harvard Business School Press.

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher, 27*(2), 4.

Siemens, G. (2002. October 8). Interaction. http://www.elearnspace.org/Articles/Interaction.htm. Accessed 7 Oct 2011.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1), 3–10.

Stefani, L., Mason, R., & Pegler, C. (2007). *The educational potential of e-portfolios: Supporting personal development and reflective learning*. London: Routledge.

Sutton, L. (1999). Interaction. Available online at http://seamonkey.ed.asu.edu/~mcisaac/emc703/leah5.html. Accessed 7 Oct 2011.

Wagner, E. D. (1994). In support of a functional definition of interaction. *The American Journal of Distance Education, 8*(2), 6–29.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity. Learning in doing: Social, cognitive, and computational perspectives*. Cambridge: Cambridge University Press.

Wenger, E. (2001). Supporting communities of practice: A survey of community-oriented technologies. Available online at http://www.ewenger.com/tech/. Accessed 7 Sept 2011.

Wills, S., Leight, E., & Ip, A. (2010). *The power of role-based e-learning*. London: Routledge.

Wittel, A. (2001). Toward a networked sociality, *Theory, Culture and Society, 18*(6).

Chapter 15
Cloudworks

Introduction

Chapters 4 and 11, respectively, discuss open, social and participatory media and associated open practices. This chapter will provide a case study of a social networking site, Cloudworks, which has been developed to provide a space for practitioners to share and discuss learning and teaching ideas and designs. It will describe the perceived need for the site, the vision underpinning its development, its functionality and an overview of some of the patterns of user behaviour we are seeing emerging in the site. It will apply the community indicator framework (CIF) described in Chapter 14 to explain these patterns of behaviour.

Cloudworks

In a series of interviews (Clark and Cross 2010) and workshops, teachers were asked what would make them use technologies more in their teaching. They said that they wanted (1) access to examples of good practice, preferably in their subject discipline and (2) a mechanism for discussing these with others online. Social and participatory media seem, at first glance, to be an ideal means of supporting this, but on closer scrutiny, teachers are not using tools such as social networking sites, blogs, wikis, Twitter extensively, at least not in an educational context. Therefore, we decided to develop a new social networking site, Cloudworks, which would be designed to harness appropriate Web 2.0 functionality to enable teachers to share and discuss learning and teaching ideas.

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Development of the site began in February 2008. We began by undertaking a review of Web 2.0 functionality and exploration of how practitioners were using existing tools such as Facebook, Elgg, Ning, blogs, wikis and Twitter. From this we articulated a vision statement to guide the development of the site:

> We plan to develop a Website to foster the growth of an evolving set of user-contributed learning design tools, resources and examples of learning activities. We aim for the site to be used by Open University course teams who want to collaborate on aspects of the design of their courses as well as by people outside. We want to promote the community-based aspect of the site both as a place for people to showcase their designs and related work, and also as place to obtain inspiration and share advice when creating new designs. We believe that different people will want to use a variety of different tools for designing learning activities in different contexts and at different stages of the design process, and therefore that the site should not be tied to any specific tool but allow people a choice of formats for design (such as CompendiumLD maps, LAMS sequences and text-based formats). (Conole and Culver 2009)[1]

The initial site was developed in Drupal,[2] which is an open source content management platform. This was chosen so that we could develop and test the site quickly. We then seeded the site with content, derived via a series of Cloud Fest events with teachers, where we gathered examples of good practice and design. In addition in these events, teachers explored the site and discussed the content. We asked them what would motivate them to use such a site and what might be the barriers to using it. They felt that there was certainly a need for such a site but that there were potentially issues in terms of the quality of the content, as well as issues around copyright and ownership. Many felt that although they would be interested in reading the content, they were less willing to contribute their own content.

The site was trialled between the first release in December 2008 and April 2009, via a series of conferences and workshops. This gave us a good indication of how the site could be used to support various events and learning and teaching activities. It was clear that users wanted to have spaces on the site to discuss the content, as well as the ability to add links and references. New functionality was added based on evaluation of users' patterns of behaviour on the site and direct feedback. A major redesign was undertaken, and a new look and feel for the site was launched in July 2009.

Cloudworks combines social and participatory functionality to enable multiple forms of communication, collaboration and cross-boundary interactions amongst different communities of users. Figure 15.1 shows a screenshot of the home page. The core object in the site is a Cloud, which can be anything to do with learning and teaching, such as a description of a learning intervention, a description of a tool or resource, a question, or a discussion point. Clouds can be grouped into Cloudscapes; a Cloud can belong to more than one Cloudscape. Clouds are a combination of social and participatory functionality. Firstly, they act like a multi-user blog; anyone can start a Cloud, and others can sequentially add content to it. Secondly, they have

[1] Available online at http://www.ascilite.org.au/ajet/ajet25/conole.html

[2] http://drupal.org

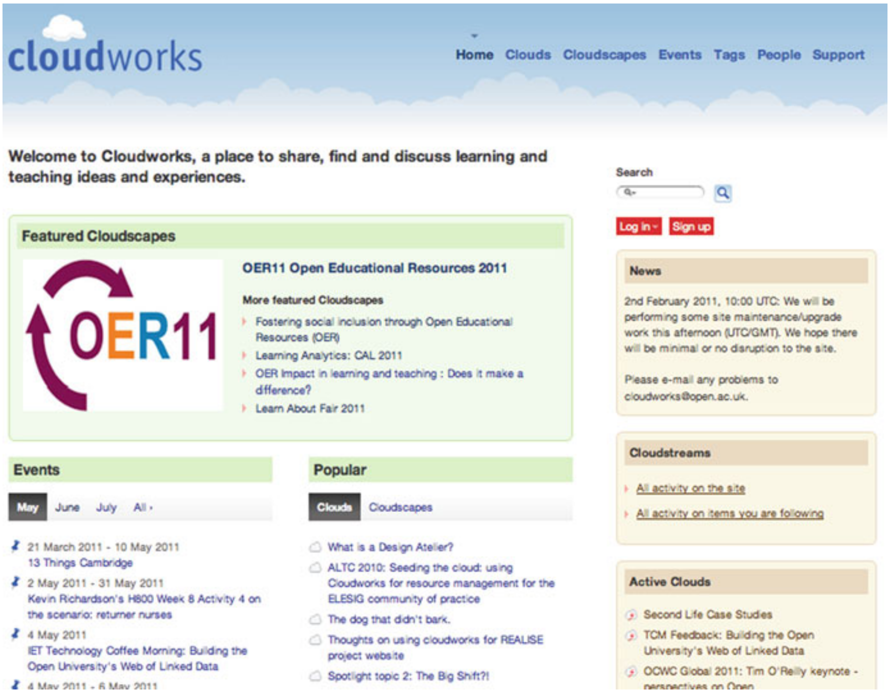

Fig. 15.1 The Cloudworks home page

a space for discussion. Thirdly, users can enrich the Cloud by adding embedded content, tags, links and references. Finally, they have additional Web 2.0 functionality, such as an activity stream for the Cloud, the ability to tag, RSS feeds and Twitter-like follow and be-followed options.

The home page includes a list of featured Cloudscapes, a list of forthcoming events, popular Clouds and Cloudscapes and currently active Clouds (Fig. 15.1). Navigation is possible via a number of routes: by browsing Clouds, Cloudscapes, people and tags, via a search option, or via activity streams for Cloudscapes, individual users or the whole site. Users can also use the favouriting feature as a sort of social bookmark. Clouds and Cloudscapes that are favourited then appear as a list on the user's profile. Favouriting enhances the creator's reputation, which appears on their profile.

The site has been evaluated in a number of ways. Data is collected via Web statistics and Google analytics. We have been analysing and categorising the types of activities that have emerged on the site. We have gathered user feedback via numerous conferences and workshops, through interviews and an online survey. Conole and Culver provide more details on our evaluation approach (Conole and Culver 2010). Anyone can view content on the site, but you need to register if you want to add content or contribute to discussions. At the time of writing the site, there were 4,094 registered users. Table 15.1 provides a breakdown of some of the statistics about the site.

Table 15.1 Cloudworks statistics May 2011

Aspect	Everyone	Team	Non-team
Cloudscapes	478	137	339
Clouds	3,987	1,688	2,319
Comments	5,084	1,245	3,839
Links	4,293	1,955	2,338
Extra content	1,033	228	805
Embeds	996	331	665

Theoretical Underpinnings

Interviews and focus groups with practitioners revealed the importance of socialisation in terms of sharing practice. Users of the site indicated that they wanted a site for sharing practice to be able to discuss learning and teaching ideas and designs with others. With this in mind, we reviewed the research literature on socialisation. As discussed earlier in the book, we have adopted a sociocultural approach (Cole et al. 1997; Daniels et al. 2007; Wertsch 1991) to our design built on the notion of mediating artefacts (Conole 2008). In particular, we found Bouman et al.'s (2007) framework for sociality helpful, along with Engeström's concept of 'social objects' (Engeström 2005, 2007). Engeström argues that social objects are key mediating artefacts that help to make social networks work. He builds on the work of Knorr-Cetina (2001) and argues that we need to adopt an 'object-orientated sociality' to social networking, suggesting that:

> The term 'social networking' makes little sense if we leave out the objects that mediate the ties between people. Think about the object as the reason why people affiliate with each specific other and not just anyone…. (Engeström 2005)[3]

Within a social networking context, objects are increasingly important in terms of mediating human relationships (Knorr-Cetina 2001). Engeström contends that the definition of a social network as 'a map of the relationships between people' is inadequate:

> The fallacy is to think that social networks are just made up of people. They're not; social networks consist of people who are connected by a shared object.[4]

This is an important distinction, and he argues that this can be used as a basis for understanding why some social networks are successful, whilst others fail. He provides examples of successful social networking sites built around social objects—such as Flickr (photos), YouTube (videos), SlideShare (documents and presentations) and sites such as 'Eventful',[5] where the objects are events. He puts forward object-

[3] Available online at http://www.zengestrom.com/blog/2005/04/why-some-social-network-services-work-and-others-dont-or-the-case-for-object-centered-sociality.html

[4] Available online at http://www.zengestrom.com/blog/2005/04/why-some-social-network-services-work-and-others-dont-or-the-case-for-object-centered-sociality.html

[5] http://eventful.com

orientated sociality as a mechanism for helping us to identify new objects that might be used as the basis for developing new social networking services. Engeström (2007) developed a set of principles for design. These included ensuring that the objects in the network are shareable and social and that the objects need to be clearly defined, with tangible actions that users can perform on the objects.

We also used Bouman et al.'s (2007) framework of sociality in terms of supporting user engagement and long-term sustainability of the site. They draw on Wenger's work (Wenger 1998), arguing that sociality cannot be designed but only designed for. Their framework provides a useful checklist for the design process. The framework is based on four design domains—enabling practice, mimicking reality, building identity and actualising self. The framework is based on three assumptions. Firstly, the system needs to accommodate both the evolution of practices and the inclusion of newcomers. Secondly, individual identity is important—so there needs to be a mechanism to enable the development of identities. Thirdly, they argue that people are more inclined to use software systems that resemble their daily routines, language and practices than to adopt whole new concepts, interfaces and methods, which suggests that metaphors and structures that mimic real-life practices are likely to be most successful.

The last chapter looked at a range of frameworks for studying online communities and interactions and introduced a new community indicator framework (CIF) that we argue can be used to both design and evaluation online social networking sites like Cloudworks (Galley et al. 2012). We have identified eight ways in which the site is being used:

- *Events.* Use of Cloudworks for conferences, workshops and seminars was one of the first patterns of user behaviour to emerge on the site. The site provides a new type of mediational space to support interactions and communications pre-, during and post-events. The discussion spaces associated with Clouds provide a forum for users to discuss issues and to collectively live-blog. The ability to add links, references and embedded content fosters collective intelligence (Lévy 1997) and crowdsourcing (Howe 2006). Because events have become such a dominant pattern of behaviour on the site, we now provide a dynamic list of events on the home page.[6] Users can also indicate that they are attending a particular event and this then appears on their profile page.
- *Debates.* A number of Cloudscapes have now been established acting as discussion spaces. Recently, we have also been exploring how the site can be used to facilitate timed discussions, see, for example, the 'Spotlight on OER' Cloudscape.[7]
- *Open reviews.* Cloudworks provides a good environment for supporting 'open reviews', that is, as a space to openly aggregate and discuss research literature reviews. Research questions can be set up as Clouds and used as a basis for discussion and aggregation of resources. Drafts of the evolving review can also be posted for comment.

[6] http://cloudworks.ac.uk/events/events_list

[7] http://cloudworks.ac.uk/cloudscape/view/2105

- *Resource aggregation*. Cloudscapes have also been established that act as aggregators around particular topics or resources. For example, there is a Cloudscape which lists and discusses mind-mapping tools.[8]
- *Courses.* The site is also being used, to some extent, to support student activities, usually in conjunction with the use of an institutional learning management system (LMS). The way in which Cloudworks is being used by students on the OU's Masters in Online and Distance Education (MAODE) course is described later in this chapter.
- *Reading circles*. A relatively new type of Cloudscape to appear on the site is reading Cloudscapes. Clouds can be set up as spaces to discuss research papers and aggregate relevant links and references.
- *Learning design.* Part of the original aspiration around the development of the site was to act as a channel for fostering more debate around design practices. A number of Cloudscapes have now been established that are focusing on learning and teaching issues around a particular course. In addition, it is now possible to embed designs produced in LAMS[9] as well as designs saved in Google Docs.
- *Expert elicitation and consultation.* Finally, the site works well as a space to elicit expert views around a topic or as a space to validate and discuss research outputs.

Using CIF to Evaluate the Use of Cloudworks

As outlined in the last chapter, the community indicator framework (CIF) consists of four dimensions: participation, cohesion, identity and creative capability.

The participation dimension is concerned with sustained user activity over time, commitment from a core group and emerging roles and hierarchy. Each of these features is evident across the various Cloudscapes on the site. For example, Alevizou et al. undertook a detailed evaluation of the use of the site by the distributed OER community (Alevizou et al. 2010). They found evidence of both short bursts of activity around particular events (such as conferences and workshops) and more sustained activity, for example, via the various Cloudscapes set up by the OLnet initiative.[10] For both the OLnet initiative and for the Cloudscape set up for the OU's learning and teaching conference, there appeared to be a commitment from a core group of users, who took ownership and moderated the spaces. In the former case, this was members of the OU OLnet team and, in the later case, the conference organisers. As use of the site has developed, a range of roles have emerged, including leadership, facilitation, support and general participation, to support different kinds of activities and to reflect the interests of the users.

[8] http://cloudworks.ac.uk/cloud/view/2201

[9] http://www.lamsinternational.com/

[10] http://olnet.org

The cohesion dimension is concerned with support and tolerance, turn taking and response, and humour and playfulness. Evaluation of the dialogic exchanges on the site shows lots of examples of the ways in which users mutually support each other. Examples include reinforcing statements, ways of drawing people into the conversation and a lack of any aggressive behaviour. Users engage in turn taking and respond to the postings of others, as well as commenting on links and references that are added to Clouds. As is evident in other social networking sites, there are lots of examples of humour and playfulness. This is mixed in with dialogic engagement around learning and teaching issues. There is a commonality of discourse across the different communities.

The identity dimension is concerned with group self-awareness, shared language and vocabulary, and a sense of community. As Cloudscapes evolve, there is a growing sense of group self-awareness, through the development of mutual interests and a sense of the Cloudscape's focus. Shared language and vocabulary are evident, and as discussed above, there is a mix of humour and serious discourse. When interviewed, users reported that they felt a sense of community with particular Cloudscapes of interests. This is reinforced though the following and favouriting functionalities.

Finally, the creative capability dimension relates to igniting a sense of purpose; multiple points of views being expressed, contradicted and challenged; and the creation of knowledge links and patterns. This is key to the site acting as a conduit of evolving understanding of learning and teaching issues and to the shared co-construction of knowledge.

Using Cloudworks to Support Practitioners

As a means of describing how the site is being used in more detail, this section will summarise the range of activities and types of user behaviour patterns in one Cloudscape. An important type of activity found in Cloudworks is its use to support events. The OU learning and teaching conference Cloudscape was set up by Karen Cropper and Martin Weller on 2 March 2010.[11] Figure 15.2 shows a screenshot of the conference Cloudscape. The conference programme consisted of four keynote external speakers (Frank Rennie, Helen Milner, George Siemens and Jimmy Wales),[12] along with a number of OU presentations spread over the conference programme.

The Cloudscape was set up to support the conference, which for the first time was held totally online. In previous years, the conference was held over 2 days at the OU with about 200 people attending. The conference in 2010 had been held over 3 days (20–22 June 2010), and in addition, to the Cloudscape, an Elluminate session

[11] http://cloudworks.ac.uk/cloudscape/view/2012

[12] http://cloudworks.ac.uk/cloud/view/2994

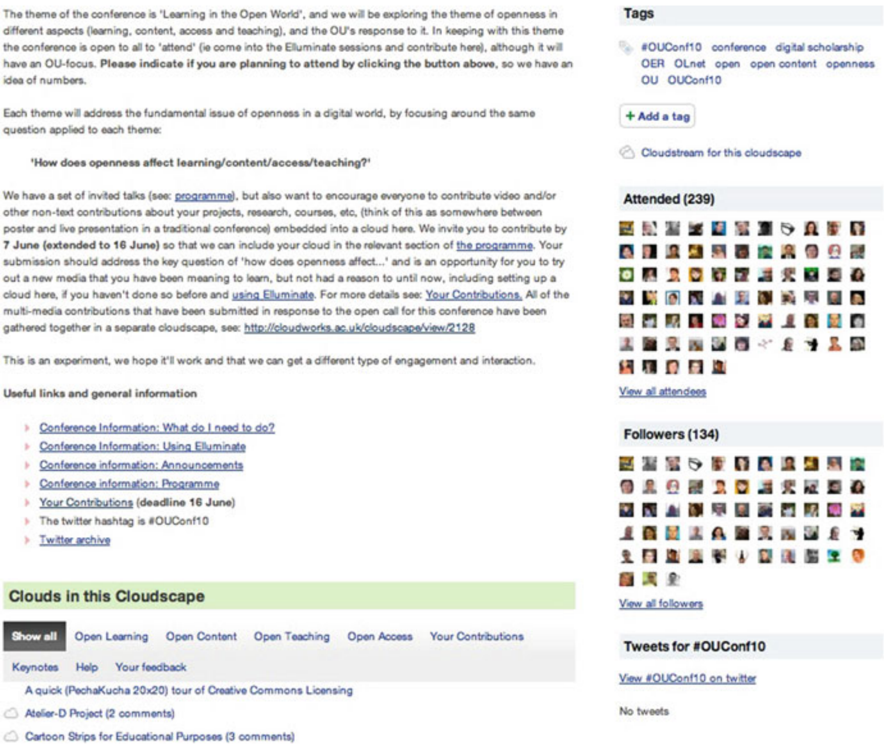

Fig. 15.2 Screenshot of part of the conference Cloudscape

was set up to support a series of synchronous keynotes and presentations. At the time of writing, the Cloudscape has had 3,465 unique visits, a considerable advance on the numbers attending the previous conferences. Two hundred thirty-nine said they were attending the conference and it had 134 followers. A number of links were included such as the following: What do I need to do? Using Elluminate, Announcements, Programme, and Your Contributions. The Twitter hashtag was #OUConf10, and a Twitter archive was set up and added as a link to the Cloudscape. In addition to the programmed talks, an interesting feature of the space was that participants were invited to add Clouds relating to their own projects, enriching the sharing and dissemination of research work in a participatory fashion. The theme of the conference was 'Learning in the Open World', explored through four aspects (learning, content, access and teaching). Participants could view all the Clouds in the Cloudscape or filter via the following tabs: Open Learning, Open Teaching, Open Content and Open Access. A final tab filtered on participants' contributions.

The structure and design of Cloudscapes are important and key to how successful they are at supporting particular learning and teaching activities. Firstly, the purpose

Table 15.2 Statistic for the Cloudscape

Feature	Number
Number of Clouds	47
Number of comments	172
Number of embeds	60
Number of items of extra content	36
Number of links	92
Number of followers	134
Number of attendees	239
Number of distinct people commenting	54
Numbers of views of Cloudscapes	3,235
Number of people logged in and viewing Cloudscape Clouds	486
Number of distinct IP addresses	4,784

of the Cloudscape needed to be clear in order to draw people in to using it. This was achieved by providing a short introductory text at the top of the Cloudscape:

> The OU has an internal conference every year to share practice and research around learning and technology. This year we are trying something new, and hosting the event completely online. The event will take place across 2 days (22nd and 23rd June), with the synchronous presentations being held in Elluminate (see Using Elluminate for session links and further info about setting up Elluminate and trouble-shooting) and asynchronous discussion held here in Cloudworks. *Please note that each of the four sessions is held in a different Elluminate space* (see the Programme for URLs). This is so we can record each one separately.[13]

Secondly, the space needed to be easy for participants to navigate around. Thirdly, it needed to mirror the synchronous nature of the conference and provide a complementary space to the Elluminate sessions.

In addition to qualitative analysis of the Cloudscape, we also gathered quantitative data. Table 15.2 summarises this. These figures are indeed impressive and demonstrate that the Cloudscape was highly active, with a significant degree of participation from those attending the conference. It demonstrates how Cloudworks can act as a shared community space for those with a common interest, as well as a space for discussion, reflection and resource aggregation around the key topics of the conference.

It was interesting to see the way in which the site was used in conjunction with Elluminate. During the sessions, participants contributed to the live chat in Elluminate commenting on the talks and adding relevant references. Many of the talks were live blogged and then posted to the relevant space on Cloudworks. Martin provided an overarching facilitation role during the conference. In addition, the Cloudscape was facilitated for a week after the conference. Martin and Karen

[13] http://cloudworks.ac.uk/cloudscape/view/2012

enlisted a number of OU people to help live-blog the conference, for example, the first day of the conference was live blogged and put up as a Cloud.[14] It included a summary of the presentations and one link to related content. A number of the Clouds included discussion posts, for example, the Open Access Cloud had four comments, an embedded SlideShare presentation and four links to related material. There were also contributions to the participants' Clouds. For example, the Cloud on 'Integrating multimedia work into assessment'[15] attracted nine comments, an embedded YouTube video and one link. The ability for participants to include their own contributions definitely enriched the nature of the conference and helped them participate and feel more inclusive. An impressive 51 additions to examples of participants' research were added.[16]

It was clear that there were a number of distinct roles adopted: Leadership, facilitation, presentation, live blogging, resource aggregation and participation were all evident. These are all nice examples of the participation dimension of the community indicator framework. Indeed, having some form of semiformal structure and facilitation was an important aspect of ensuring that the conference was a success. The cohesion dimension was evident in a number of respects. Firstly, as the conference occurred synchronously, participants needed to set aside time to view the presentations and contribute to the discussions in both Cloudworks and Elluminate. The discussion spaces enabled them to reflect on the presentations and related Clouds and respond to the postings of others. Participants had a shared sense of identity and a sense of common purpose, namely, an interest in exploring learning and teaching issues through the lens of openness. Finally, the creative capability dimension represented itself in a number of ways. Firstly, there is evidence of multiple points of view being discussed in participants' postings. Secondly, participation in the conference resulted in an updating of some of the latest research in the field and hence was a form of professional practice.

Many of the comments were reflective in nature, for example, this posting on the 'From Open Content to Open Thinking' Cloud[17]:

> I guess the good and bad thing you face is that people aren't really used to categorising their thoughts in this way. So the good part is that Cohere encourages people to reflect on their own argument and to become clearer when constructing it. This is surely what education should be doing. The 'bad' part is that there is an additional barrier for people to overcome in using it – so you have the new technology element (even if it is easy to use) and also the new mental processes to develop. The pay-off may be worthwhile but it'll be interesting to see if this double hit at the start is too much for many. And that is interesting for all of us in ed tech as it has implications not just for Cohere but also for whether we can use the social Web to go beyond just sharing 'stuff'.

[14] http://cloudworks.ac.uk/cloud/view/4022

[15] http://cloudworks.ac.uk/cloud/view/2631

[16] http://cloudworks.ac.uk/cloud/view/2978

[17] http://cloudworks.ac.uk/cloud/view/3947

A Cloud was set up to enable participants to reflect and comment on their experience of the conference.[18] The comments posted indicated that on the whole participants found the conference a valuable experience. Below are some examples of the comments left which demonstrate this. For example, participants valued the ability to be able to attend the conference from anywhere, and indeed there were participants from around the world:

> An inspirational first day, particularly the #gsiemens session. I 'attended' from my sofa here in Bath using Elluminate and had no technical glitches at all – pretty amazing for 6 solid hours online. The 'fully open' nature of the conference was in itself an innovation and set a significant example to the sector.

They liked the way the different technologies (Twitter, Elluminate, Cloudworks and personal blogs) worked together, each one supporting different aspects of the conference activities and the way in which the live bloggers were able to capture the essence of the different presentations and quickly post them up:

> I too thought that the conference went really well today and the cross-channel interoperability and live-blogging were great too.

The combination of Elluminate and Cloudworks worked well, although there were some suggestions for how the link between them could be improved:

> I like the synchronous chat on Eluminate, and it's a great tool for both presenters and participants to engage in meaningful discussions. The only shame is that very interesting chat stays within Eluminate; is there a way for inviting participants to engage in such discussions in Cloudworks? I tried to paste discussion in Cloudworks, but worry about ethical considerations. I guess, on the other hand, that Doug's very efficient live-blogging captures most audience interaction/discussions :)

This quote also illustrates the supportive nature of the discourse that the participants used cross-referencing to others and using a positive tone to express their thoughts.

One participant blogged his reflections of the conference.[19] His post includes some insightful and reflective thoughts on the ideas generated from the conference, in particular on the changing nature of learning and teaching. Members of the conference team then responded to the points he made in his blog post.

There were however some criticism of the conference, particularly around some technical glitches in using Elluminate and also the following comment:

> Possibly deep thinking was represented in some (many?) of the conference contributions via clouds, etc., but they 'did not rise to the top' (the expression of someone in a pre-conference interview, I think). There is a serious issue with allowing open contribution -- a danger of a tyranny of structurelessness.

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[18] http://cloudworks.ac.uk/cloud/view/2992

[19] http://bathspaWeb2.edublogs.org/2010/06/22/conference-report-learning-in-an-open-world/

Reflecting on the success of the conference, Weller could see a number of success factors and also ways in which the conference could be improved (Weller 2010). Clearly having the conference online enabled a far wider audience to participate; however, the lack of face-to-face contact and socialisation was a drawback.

Using Cloudworks to Support Learning

As an alternative example of how Cloudworks has been used, this section will describe the way in which students on the OU's MAODE[20] H800 module used the space. In the course content, the students were invited to take part in a number of activities in Cloudworks. As a result, three Cloudscapes were set up: a general one, entitled H800[21]; one relating to a specific course activity[22]; and one to support the H800 flash debates.[23, 24]

The H800 Cloudscape had 491 unique visits; given that there were only about 130 students on the module, this suggests that others were also viewing the Cloudscape. Indeed, this was evident in some of the postings on the Cloudscape from those outside the course. The Cloudscape consisted of 11 Clouds. One supported the H800 CloudQuest challenge that the students were required to do as part of the module's activities.[25] This activity aimed to help familiarise students with the site, by getting them to explore the site to answer a set of questions. It resulted in 21 postings and 2 links. I moderated the space and responded to the comments the students left.

The students enjoyed the CloudQuest and found it useful, as the following quote illustrates:

> I enjoyed the cloudquest. There is so much, just glad it is alphabetically categorised. Will be suggesting it to my trainee teachers, especially those who may not have a VLE within their organisation to use. I must explore this site some more to see how it can be used effectively.

He went on to say, in a later post, that he could see how the site might be used to support educators, cross-referencing comments he made in a closed module Elluminate session:

> That is precisely the point I made in an Elluminate tutorial with my study group yesterday. I see it as a site that would support educators, reducing the need for google searches, teacher.net searches, etc. I already found several items that will be useful not only for me but also for my trainee teachers.

[20] http://iet.open.ac.uk/courses/ode.cfm

[21] http://cloudworks.ac.uk/cloudscape/view/1442

[22] http://cloudworks.ac.uk/cloudscape/view/2057

[23] A 'flash debate' is a hot topic which is quickly populated with discussion points and resources.

[24] http://cloudworks.ac.uk/cloudscape/view/1937

[25] http://cloudworks.ac.uk/cloud/view/2699

This quote also shows how the students can see the value of the site to support their professional practice. The following quote also illustrates that the students found it a useful activity but also indicates some concerns in terms of how to best use the site:

> I've just arrived at Cloudworks and have learnt a lot about using it from this challenge. In fact, I'd recommend students on H800 complete the challenge first before they attempt Activity 4 (which brings us here). I was unclear about what I actually had to do for the activitiy and this isn't a good frame of mind to be in when exploring a new application! When I was more familiar with Cloudworks (via the challenge), focusing on what I was meant to do for Activity 4 was better – but that may say more about me than the activitiy!

The following quotes show that the students can see that the site is a extensive and useful resource for learning and teaching:

> As someone else said, there is just so much! – it makes me feel like my head is an exploding cloud – but I know it's going to be a really useful resource for up to date info.
>
> As a newcomer to education as a student I have been completely overwhelmed by the availability of resources and the use of technology in a creative way to give access to expertise and experience. Great site and great idea.
>
> Hi, all I'm also impressed by the range and potential of Cloudworks, and can think of numerous occassions when it would have been useful to me! And will be in the future I'm sure.
>
> I echo many of the sentiments shared by my H800 colleagues. I think cloudworks is a great Social Information Network (SIN) and Community of Practice (COP) tool as it focuses specifically on teaching and learning, thereby having the relevance that is needed to sustain social networks and COPs.

Flash debates were identified as a new form of activity on the site in September 2009 with the 'Is Twitter killing blogging' Cloud.[26] A specific flash debate Cloudscape was set up for the H800 students,[27] and they were invited to contribute Clouds on topics they were interested in discussing with their fellow students. There were 418 unique visits to the Cloudscape, and a total of 11 Clouds were added, including some Clouds that had been created prior to the running of the module (e.g. the 'Has Twitter already peaked?'),[28] which the students found and wanted to continue discussing. This is a nice example of boundary crossing (Wenger 1998) between different communities within the site. The topics the students were interested in included the pros and cons of video conferencing tools (such as Elluminate and FlashMeeting), the end of certification, a comparison of the nature of discussion in closed spaces (like forums) with discussions in open spaces (like Cloudworks), distance learning problems with teaching physics and how to reach a tipping point with a new technology.

[26] http://cloudworks.ac.uk/cloud/view/2266

[27] http://cloudworks.ac.uk/cloudscape/view/1937

[28] Cloud http://cloudworks.ac.uk/cloud/view/3374

Table 15.3 Statistics on the H800 flash debate Cloudscape

Feature	Number
Number of Clouds	11
Number of comments	123
Number of embeds	2
Number of items of extra content	3
Number of links	32
Number of followers	10
Number of attendees	0
Number of distinct people commenting	59
Numbers of views of Cloudscapes	418
Number of people logged in and viewing Cloudscape Clouds	144
Number of distinct IP addresses	1,390

References
1. http://cloudworks.ac.uk

As Table 15.3 shows, the patterns of activity in this Cloudscape are different to those found on the OU's learning and teaching conference Cloudscape described in the last section. Not surprisingly, given the focus of the Cloudscape, there are proportionately more comments than links or embeds. There are no attendees as this is not an event Cloud, and as the distinct IP addresses show, a lot more people than are on the course are viewing the space.

Whereas the first two Cloudscapes for H800 described were set up by me, the third[29] was set up by one of the students, in relation to one of the activities they were asked to complete on the module. The Cloudscape had 218 views and consists of 9 Clouds, most of which relate to students discussing the implementation of technology in different subject disciplines, in particular social work, nursing and statistics. The statistics Cloud[30] was particularly popular with 208 views, 12 comments and 4 links. Rather than posting discussion posts, the students posted links to relevant resources for teaching statistics. So the Cloud is more of an example of a collective resource aggregator than a discussion Cloud.

The 'H800 Using Cloudworks on the H800 course'[31] was set up to elicit feedback from the students on their experience of using Cloudworks and their perceived value of the site. Views were mixed. Some students found the site rather overwhelming:

> I'm finding this all a bit mind-blowing. My hide-bound ideas are probably tripping me up as I'm wondering how it's possible to keep track of everything. Surely chaos results!
>
> I agree about chaos. I feel I've been thrown into a vortex and am just spinning around. No doubt familiarity will resolve this.

[29] http://cloudworks.ac.uk/cloudscape/view/2057

[30] http://cloudworks.ac.uk/cloud/view/3222

[31] http://cloudworks.ac.uk/cloud/view/2700

Responding to this, another student evidently could see the pros and cons of open versus closed spaces:

> Urusula you raise a very valid point about keeping in touch with all the different online spaces. Our H800 group discussion forums are established spaces where debate can occur without having to work in this new cloudworks space. Some people may feel 'safer' in this more restricted environment. Where I do see an advantage is as in the L140 En Rumbo Spanish cloudscape where participants are sharing resources and developing a community of participants beyond the confined life of an OU course.

A former H800 student described how the site had become an important part of her everyday academic practice:

> As a former student enrolled in H807 and H809 courses, I can understand your early feelings here in Cloudworks. No doubt that moving from a defined group in a VLE to a network of practitioners in Cloudworks requires some time and adaptability. I agree with John that familiarity helps to overcome the initial feeling of 'chaos'. I also think Julie (my ex classmate :-)!) is right when she underlines the value of Cloudworks 'beyond the confined life of an OU course'.
>
> Actually for me this environment has become an integral part of my professional life as an elearning practitioner: even, 'living here' sometimes I succeeded to better understand some concepts that I had previously studied in the formal courses.
>
> I think a change of attitude could also help: I moved from an objective-driven approach, that fits to a planned and outcome-based course to a serendipitous approach, more rewarding in a social network environment.

Another student recommended persevering, arguing that getting to grips with new technologies takes time but is worth the investment in the end:

> John, I found I became more comfortable with the new environment Cloudworks presents the more I "poked" around it so agree that familiarity should resolve this.

Other Types of Activities in Cloudworks

Finally, this section will point to some examples of the other six types of activities in Cloudworks outlined at the beginning of the chapter, namely, debates, open reviews, resource aggregation, virtual reading circles, learning designs and expert elicitation/consultation.

Debates are evident across a number of Cloudscapes. For example, 'The VLE is Dead' debate Cloud[32] arose from a session held at the ALT-C 2009 conference. The tension between institutional virtual learning environments (VLEs) and more open technologies has been a hot topic for debate for a number of years across the blogosphere. Rather than acting as a discussion space, this Cloud acted more as a resource aggregator point to relevant links and blogs on the topic. It has had 2,173 views, and 3 people favourited it. The actual session was live-blogged into the Cloud, but what

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[32] http://cloudworks.ac.uk/cloud/view/2162

was more interesting was the way the Cloud then evolved into an extensive resource of links on the topic. A total of 50 links and 2 references were added over a short period of time. Interestingly one contributor in particular was very active in terms of adding links. A slightly different type of debate was used by the OPAL project team, who set up a series of 'Spotlights on Open Educational Practices'.[33] The Cloudscape had 1,258 unique views and proved a useful means of facilitating a discussion around OER and their associated practices, drawing on the data gathered through analysis of 60 OER initiatives. The spotlights each lasted a week and were introduced with a short video describing a particular topic to discuss.

The 'Reviewing the use(s) of Web 2.0 in higher education' Cloudscape[34] is a good example of how the site is being used to support open research reviews. The creator of the Cloud posted her research questions as Clouds and then added appropriate links and references. The Cloudscape had 1,477, and six people favourited it. The Cloudscape has 27 Clouds associated with it, including five specifically related to the review's research questions. The Cloud 'Q4: why has general web 2.0 practice not translated well/extensively into an HE context?' generated 16 comments. These were very rich, insightful comments on issues around the lack of uptake and use of Web 2.0 technologies; the following quotes give an illustration of the depth of the discussion:

> I think that one of the critical factors is how comfortable staff feel using Web2.0 type tools for their own research/ personal interests.
>
> For generations, those with a teaching role have encouraged students to read – and have themselves read for pleasure as well as for work. Most will have also written – both for work and socially.
>
> However, it's much harder to get the enthusiasm and ability to add inside knowledge (e.g. when we're discussing reading text books – we often compare the different ways you tackle a text book – and a murder novel)
>
> If we, as staff, don't have that ease with Web2.0 tools, then it's going to be really hard to get students enthusiastic.

Another respondent agreed with this and added:

> I think there are two separate angles—the extent to which Web 2.0 has translated into teaching and the extent to which it has translated in to the practice of educators in HE. As Emma says, the former depends on the latter.
>
> I'm not convinced that folk in HE used Web 2.0 sites any less than in most other professions though. You need a critical mass of people you know professionally to also be using them for them to be useful and you need to spend a reasonable amount of time in front of a computer or smartphone which will rule out a certain proportion of academics.

Finally, someone wondered what the role of institutions should be in addressing this lack of uptake:

> I wonder how many HE institutes actively promote and support the experimental use of Web 2.0 and other technologies by academics?

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[33] http://cloudworks.ac.uk/cloudscape/view/2105

[34] http://cloudworks.ac.uk/cloudscape/view/1895

Resource aggregation is another type of activity observed on the site. The VLE debate Cloud is one example. Another is the 'Good examples of mindmapping in teaching?'[35] The Cloud had 1,654 unique views and includes an extensive list of different mind-mapping tools, along with a description of how they can be used to support learning and teaching. Students are also resource aggregating around relevant resources and links for their courses, see, for example, the Cloudscape set up for the En Rumbo OU Spanish course.[36]

ELSIG is a community of over 500 researchers interested in exploring learners' experiences of using technology. It has been using a Ning site[37] for a number of years to support the group's activities but recently set up a space in Cloudworks to support a virtual reading circle.[38] They found the functionality of Cloudworks to be able to both discuss Clouds and add links and references particularly suitable for this kind of activity. The Cloudscape has 20 Clouds, pointing to various research resources, including both papers and presentations. Each Cloud could then be discussed by the group and relevant links and resources added. The Cloudscape had 343 views, and 2 people favourited it.

Another type of activity evident in Cloudworks is its use to share and discuss learning and teaching designs. As part of the OULDI, we ran a range of learning design workshops using Cloudworks as a space for participants to share and discuss the activities they engage with during the workshops. One example of this was a workshop run at Brunel University.[39] There were 659 views of the Cloudscape, and two people favourited it. It consisted of 26 Clouds; these included Clouds associated with the workshop activities. Other Clouds included the participants' outputs. In particular, they used the learning design conceptual views described in Chapter 8 to represent the courses they were developing. For example, one Cloud[40] shows three of the views one team produced, namely, the course map view, the pedagogy profile and the task swimlane representations discussed in Chapter 8. Participants uploaded their views to a shared space on Flickr and then embedded them into the Cloud. Others were then invited to add comments and to compare the views generated across the groups.

The final type of activity evident in Cloudworks is its use to support expert elicitation. For example, it has been used by members of the University of Exeter, to carry out a Delphi method study, which was concerned with the role of educational technologists to support learner experiences.[41] The Cloudscape had 1,324 views and

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[35] http://cloudworks.ac.uk/cloud/view/2201

[36] http://cloudworks.ac.uk/cloudscape/view/776

[37] http://elesig.ning.com/

[38] http://cloudworks.ac.uk/cloudscape/view/2047

[39] http://cloudworks.ac.uk/cloudscape/view/1912

[40] http://cloudworks.ac.uk/cloud/view/2639

[41] http://cloudworks.ac.uk/cloudscape/view/1872

contains 11 Clouds. Nine of these were the research questions associated with the study. In addition to the Cloudscape, the questions were also sent to the Association for Learning Technologies mailing list (a list for learner technologists in the UK). It was interesting to note how the nature of the discussions in the two spaces differed, demonstrating the influence the affordances (Gibson 1977, 1979) of different technologies have on patterns of user behaviour. On the mailing list, people tended to respond with relatively short comments, whereas in Cloudworks there was more evidence of them also adding links and references and responding to the comments made by others so that a shared dialogic exchange emerged. Galley provides a more detailed evaluation of the Cloudscape (Galley 2010).

Conclusion

This chapter has described a new social networking site, Cloudworks, which has been designed as a space for learners and teachers to share and discuss learning ideas and designs. It has provided a description of the vision behind the development of the site and its functionality. A detailed description of the Cloudscape set up to support the OU's learning and teaching conference was discussed, which provides a nice illustration of the types of user behaviour, interaction and community engagement we are seeing on the site. As this Cloudscape illustrates, Cloudworks appears to be acting as a unique back channel, discussion space and resource aggregator to complement real-time or virtual conference activities. As a contrast, the use of Cloudworks to support the OU's MAODE H800 module was discussed. This showed how the students used the site to support their learning, develop shared understanding, discuss learning and teaching ideas and aggregate resources. Finally, the remaining six types of activities identified on Cloudworks were briefly discussed.

We are continuing to develop new functionality for the site based on ongoing evaluation of the patterns of user behaviour in the site. Recently developments include the ability to private message individuals or groups of people on the site. We also have an open source version of the site, CloudEngine,[42] which means that the site could be cloned and used for other purposes where discussing and sharing ideas around social objects would be useful. An API (Applications Profile Interface) is also available for the site. One obvious related area in education would be the development of a social networking site to support the research community, perhaps integrated with institutional research repositories.

We believe that Cloudworks offers a new type of social networking site, which is distinct from but complementary to other social networking sites. The design of the site around the notion of social objects means that it differs from egocentric site like Facebook. The combined Web 2.0 functionality means that the community can

[42] https://bitbucket.org/cloudengine/cloudengine/wiki/Home

collectively improve Clouds, through discussion and addition of content and resources. There is now a vibrant community of those interested in learning and teaching participating in the site. Users come from over 170 countries and span the educational spectrum, from formal educational contexts to informal and non-formal ones. Teachers, learners, researchers and policy makers are interacting and communicating. There is evidence that some users are now beginning to appropriate niche ecologies of the site for their own interests. We will continue to evaluate the evolving use of the site and to add additional functionality. It will be interesting to see how the open source version of the site, CloudEngine, is taken up and used.

References

Alevizou, G., Conole, G., & Galley, R. (2010). *Using Cloudworks to support OER activities*. Report for the HE Academy. Milton Keynes: The Open University.

Bouman, W., Hoogenboom, T., Jansen, R., Schoondorp, M., de Bruin, B., & Huizing, A. (2007). *The realm of sociality: Notes on the design of social software*. The 28th international conference on information systems, Montreal, Canada.

Clark, P., & Cross, S. (2010). *Findings from a series of staff interviews about learning design, representations of design, design process, evaluation and barriers*, Appendix 2, The OU Learning Design Initiative Project Phase Two Report, Embedding learning design and establishing a reversioning culture. Milton Keynes: The Open University.

Cole, M., Engeström, Y., & Vasquez, O. A. (1997). *Mind, culture and activity: Seminal papers from the laboratory of comparative human cognition*. Cambridge, UK: Cambridge University Press.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinhi, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hersey: IGI Global.

Conole, G., & Culver, J. (2009). Cloudworks: Social networking for learning design. *Australasian Journal of Educational Technology 25*(5), 763–782. http://www.ascilite.org.au/ajet/ajet25/conole.html. Accessed 7 Oct 2011.

Conole, G., & Culver, J. (2010). The design of Cloudworks: Applying social networking practice to foster the exchange of learning and teaching ideas and designs. *Computers in Education, 54*(3), 679–692.

Daniels, H., Cole, M., & Wertsch, J. V. (2007). *The Cambridge companion to Vygotsky*. Cambridge: Cambridge University Press.

Engeström, J. (2005). Why some social network services work and others don't — Or: The case for object-centered sociality %U http://www.zengestrom.com/blog/2005/04/why_some_social.html. Accessed 7 Oct 2011.

Engeström, J. (2007). Microblogging – Tiny social objects on the future of participatory media, cited in K. Anderson, blog entry June, 2007. http://strange.corante.com/archives/2007/06/13/nmkforum07_jyri_of_jaiku.php. Accessed 7 Oct 2011.

Galley, R. (2010). *A framework of community indicators for online environments*. Milton Keynes: The Open University.

Galley, R., Conole, G., & Alevizou, P. (2012). Community Indicators: A framework for building and evaluating community activity on Cloudworks. *Interactive Learning Environments*.

Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing*. New York: Hillsdale.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Hillsdale: Lawrence Erlbaum Associated.

Howe, J. (2006). The rise of crowdsourcing. *Wired Magazine* Issue 14.06. Available online at http://www.wired.com/wired/archive/14.06/crowds_pr.html. Accessed 7 Oct 2011.

Knorr-Cetina, K. (2001). Objectual practice. In T. Schatzki (Ed.), *The practice turn in contemporary theory*. London: Routledge.

Lévy, P. (1997). *Collective intelligence: Mankind's emerging world in cyberspace* (R. Bononno Trans.). Cambridge, MA: Perseus Books.

Weller, M. (2010, June 25). Open conferences and the legitimacy deficit, blog posting. http://nogoodreason.typepad.co.uk/no_good_reason/2010/06/index.html. Accessed 7 Oct 2011.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity. Learning in doing: Social, cognitive, and computational perspectives*. Cambridge: Cambridge University Press.

Wertsch, J. V. (1991). *Voices of the mind. A sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Chapter 16
Conclusion

Introduction

In this final chapter, I want to summarise the key messages conveyed throughout the book. I will summarise the chapters, along with considering the implications of each topic. I will critically reflect on the implications of each of the topics, in particular what impact the learning design methodology described in this book might on learning and teaching and how it might help to change the way learning interventions are designed. The central thesis of this work is that we need new approaches to design in order to make more effective use of new open, social and participatory media.

This book has argued that designing for learning is the *key* challenge facing education today. To make effective use of the affordances (Gibson 1977, 1979) of open, social and participatory media, learners and teachers need guidance and support. Learners and teachers lack the necessary digital literacy skills (Jenkins et al. 2006; Jenkins 2009) needed to embrace the full potential of these technologies. The book has described a new learning design methodology which aims to provide this support, through visual designs (to enable teachers to think beyond content to the activities and overall learner experience), pedagogical planners (which guide the teacher through the design process and provide templates that they can adapt and repurpose) and effective use of social networking tools, so that learners and teachers can be part of a global, distributed network of community of practice (CoP) (Wenger 1998). The visual designs, pedagogical planners and social networking tools are essentially mediating artefacts (Conole 2008) that can guide practitioners' design practices and make them more explicit and shareable with others. A key intention of the learning design approach is to shift teachers' design practice from being implicit and belief based to one that is explicit and design based.

The learning design research work described in this book is located alongside related research fields, such as instructional design, the learning sciences, pedagogical patterns and research on open educational resources (OER). It has shown how learning design is aligned to these but is also distinct from them.

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Open, Social and Participatory Media

New open, social and participatory media clearly have significant potential to transform learning and teaching. The emergence of these technologies has shifted practice on the Internet away from passive information provision to active user engagement. They offer learners and teachers a plethora of ways to communicate and collaborate, to connect with a distributed network of peers and to find and manipulate information. In addition, there are now a significant range of free educational resources and tools. However, despite this, technologies are still only used marginally in an educational context. Learners and teachers lack the necessary digital literacy skills to harness these new technologies.

This new learning context raises some thought-provoking issues. In a world where content and services are increasingly free, what is the role of formal education? What new teaching approaches and assessment methods are needed? How can we provide effective learning pathways to guide learners through the multitude of educational offerings now available? How can teachers develop new approaches to the design of learning activities and whole curricula that takes account of this new complex, technologically enhanced context? What assessment strategies are appropriate?

Falconer and Littlejohn (2008, p. 20) argue that there are three challenges facing teachers: (1) the increasing size and diversity of the student body, (2) the increasing requirement for quality assurance and (3) the rapid pace of technological change. Conole (2004) has argued that there is a gap between the promise and reality of the use of technology in education and that there is little evidence that education has changed fundamentally. Much use of technology appears to simply replicate bad classroom practice resulting in simple Web page turning (Oliver 2000). Similarly Masterman (2008, p. 210) argues that the lack of uptake of technologies is due to a number of factors: lack of awareness of the possibilities, technophobia, lack of time to explore the use of technologies, aversion to the risks inherent in experimentation and fear of being supplanted by the computer. Agostinho et al. (2008, p. 381) suggest that the uptake of the use of high-quality information and communications technologies (ICT)-based learning designs in higher education has been slow. Factors include low levels of dissemination of ICT-based learning projects, lack of ICT-based learning examples to model and lack of time, support and training. Sawyer (2006, p. 8) argues that the impact of the significant investment in computers in schools has been disappointing. There are few studies that show that computer use is correlated with improved student performance. Similarly Koedinger and Corbett (2008, p. 61) write that as new technologies have emerged, many hoped that they would have a radically transformative effect on education, but in reality the impact was much less than expected.

The gap between the potential and actual use of technology is a paradox, and this is at the heart of the growth of a new area of research that has emerged in recent years. Learning design research aims to better understand this mismatch (Beetham and Sharpe 2007; Lockyer et al. 2008). It focuses on the development of tools, design methods and approaches to help teachers design pedagogically effective learning activities and whole curriculum, which make effective use of technologies.

Therefore, there is little doubt that open, social and participatory media enable new forms of communication and collaboration for both learners and teachers. They can provide us with mechanisms for sharing and discussing learning and teaching ideas. However, as discussed in Chapter 14, the nature of online communities and interactions in these spaces is complex, evolving and distributed. Learners and teachers need to develop new digital literacy skills to effectively participate in these spaces, as well as an understanding of the nature and form of their digital identity. How do they want to be represented in these spaces? To what extent do they want to adopt open or more closed practices? The implications of fully harnessing new technologies in an educational context are profound. We are seeing a blurring of boundaries: learners and teachers, learning and teaching, formal and informal modes of learning, and real and virtual spaces. We need to rethink all aspects of learning and teaching: how courses are design and delivered, the ways in which learners are guided and supported and the mechanisms for assessment. Old practices of assessment strategies are no longer appropriate and indeed are woefully inadequate in terms of providing learners with the necessary skills and competences to participate in an increasingly complex and global societal context. Institutions are also being challenged by these new technologies.

Firstly, increasingly researchers are opting to make their research publications publicly available, often via institutional repositories. Some are going further by making their actually data available. Initiatives such as ePrints have changed the ways researchers distributed their findings. Many institutions now require academics to deposit their outputs in institutional research repositories, and national level research assessment exercises add an additional pressure in terms of academic accountability and measure of the impact of their research.

Secondly, sites such as iSpot[1] and Galaxy Zoo[2] (discussed in Chapter 11) demonstrate that researchers are beginning to harness the collective wisdom of the crowds, through use of distributed networks of users to collect data on a global scale. Such sites play a dual function, in terms of raising awareness of science and as a mechanism for researchers to gather data on an unprecedented scale.

Thirdly, as Weller argues (2011), digital scholarship is becoming increasingly important and is changing the way in which academics communicate, as well as how they disseminate their teaching practices and research findings. All of these are challenging traditional publication mechanisms. Publishing houses need to develop new business models to take account of this.

Fourthly, more open practices (in terms of the use of open educational resources and the growth of 'free' courses such as the massive online open courses (MOOC) discussed in Chapter 10) are challenging traditional educational offerings. In a world where content and expertise is free, what is the role of traditional educational institutions? As with the publishing houses, institutions will need to develop new business models. Nascent work is already occurring in this respect. For example, in

[1] http://www.ispot.org.uk/

[2] http://www.galaxyzoo.org/

terms of OER, Downes (2007) has described a number of new business models that have emerged in recent years. Arguably, institutions need to shift away from a focus on content as a commodity to providing effective learning pathways for learners, along with flexible accreditation models. A number of new types of organisations are beginning to emerge that adopt more open and flexible offerings, for example, the OER university, a consortium that provides a mechanisms for members to flexibly accredit learners who are using OER and the peer-to-peer university, which has developed a peer-support 'badging' system to recognise learners' competences.

Fifthly, learners are also changing (Sharpe et al. 2010), embracing new technologies to support their learning and adopting more just-in-time and collaborative approaches to learning. However, despite the fact that today's learners are indeed technologically immersed, it is not evident that all of them have the necessary skills to make effective use of technologies to support their learners. Many are confused by the plethora of resources and tools they can use and lack the necessary academic skills to make effective choices about resources and tools. They need guided learning pathways to help them, and this is clearly a role that educational institutions can provide.

Sixthly, legacy institutional systems are at odds with the tools and services that are now available in the cloud (Katz 2008). What services should institutions be providing, and what should they be outsourcing? What is the relationship between institutional learning management systems and freely available tools and services? Learners are now creating their own personalised digital learning environment, mixing institutional systems with their own choice of tools.

The learning design methodology introduced in this book aims to address the challenges described above. A number of recommendations can be made for the key stakeholders involved in education.

For learners, institutions and teachers, in particular, need to provide appropriate support mechanisms to enable learners to develop the digital and academic literacies they will need to effectively engage with new technologies. Given the opportunities that social and participatory media afford in terms of adopting more constructivist and socially situated pedagogies, we need to facilitate more learner-centred approaches. Also we need to think of how technologies can be harnessed to encourage communication and collaboration amongst learners and their peers. Finally, we need to shift from a focus on content to activities.

For academic staff, we need to recognise that these new technologies provide a plethora of new approaches to teaching and research, and hence, we need to be aware of and take account of these. Academics need to adopt more explicit and reflective practices and embrace the full potential of the notion of digital scholarship. Engagement with new technologies cannot be at arm's length; it is only through technology immersion—learning by doing, through the technologies—that academics will come to understand how they can appropriate their technologies to support all aspects of their practice. We need to also use the technologies to encourage a networked community of academics, sharing and discussing learning, teaching and research ideas.

At an institutional level, we need to put in place appropriate strategies/policies that reflect the changing context of education and that take account of the implications of using technologies for learning, teaching and research. We also need to have adequate resources and support to facilitate the shift in practice needed. Strong leadership, with an understanding of the issues, will be needed, along with a revisioning of institutional structures and processes. Alongside the strategic directives, institutions will need to have in place appropriate professional development and incentives for academics, to help them make more effective and increase use of technologies.

Finally, at a national level, we need to develop an infrastructure to support the growing range of free resources, tools and research outputs. We need also to facilitate the creation of a distributed professional networks and communities to promote and share case studies of good practices. As at the institutional level, nationally there will also be a need for appropriate strategies and policies (and associated funding) around using technologies. Finally, we need mechanisms to support the ongoing horizon scanning of technology trajectories, so that we can future proof how emergent technologies might be used for learning, teaching and research and what might the implications be for individuals and organisations.

On a positive note, social and participatory media provide learners and teachers with a rich set of multimedia representations of content and multiple communication challenges. Learning resources can be accessed anywhere and anytime to support flexible and personalised learning. There is now an abundance of free tools and resources that learners and teachers can use. Access on a truly global level means that learners and teachers can connect with each other on an unprecedented scale, and for researchers, the new media mean that their research outputs can have far greater impact to a wider audience almost immediately.

On a negative note, the digital divide (Warschauer 2004) is still present, narrower but deeper; whether this is because of lack of access or skills or through personal choice not to engage with these technologies, it is a reality and needs to be taken account of when designing for learning. The very richness of the online digital space means that it is complex and difficult to traverse; it may be true that everything a learner or teacher might need is on the Web, but finding what is appropriate for a specific need is far from trivial. There are also access, privacy and ownership issues; whilst licences such as Creative Commons have gone some way towards addressing the copyright issues associated with resources, it has not answered all the concerns many still have. Many social networking sites are using personal data in convert ways, unknown to the users. Furthermore, this form of re-appropriation of data and digital surveillance is only likely to increase as the data mining tools behind such services become ever more powerful

Future Research Directions

Arguably we are now at an important watershed in terms of learning design research. Over the last decade or so, research in this area has given us rich insights into practitioners' design practices, along with an indication of the barriers they face. A number of distinct sub-research areas have emerged (principally on design languages and visualisations, pedagogical patterns and the use of social networking tools to share and discuss learning and teaching ideas and designs). There is now a need to build on this work and develop a more coherent learning design framework, which will enable practitioners to use all of these approaches in a seamless and holistic fashion. Achieving effective uptake of these approaches, beyond the early adopters, will require systemic change. Therefore, learning design approaches will need to be embedded in institutional systems and processes, in particular the course approval process and course quality approval mechanisms. This is the only way that wide-scale change in practice can be achieved. Learning design needs to address the needs of all stakeholders involved in education: learners (in terms of the way in which the intended design can be made more explicit to them, in order that they can use this effectively in undertaking their learning activities), teachers (in terms of guiding and making the design process more explicit and hence shareable with others), institutional managers (in terms of design being an embedded part of institutional systems and process) and policy makers (in terms of future directions for policy and strategy to promote effective and innovative pedagogical processes and associated funding and initiatives).

A series of themes are interwoven across the book. These include the nature of openness, promoting creativity, new ways of thinking about design, issues around social inclusion and exclusion, and new practices and pedagogies. So what might an agenda for future learning design research look like? Here is a list of some of the key questions I think as a research community we should be addressing in the coming years:

1. What might a coherent learning design language look like, and how might it be shared?
2. What other mediating artefacts do we need to develop to enable learners and teachers make more effective use of technologies to support learning? What are the different ways in which learning interventions can be represented?
3. How can we foster a global network and community of practice to enable learners and teachers to share and discuss learning and teaching ideas? How can social networking and other dialogic tools be used to enable teachers to share and discuss their learning and teaching practices, ideas and designs?
4. What tools do we need to guide design practice, visualise designs and provide a digital environment for learners and teachers to share and discuss?
5. What are the implications and likely impact of social and participatory media for education, and how can they be harnessed more effectively to support learning?
6. What will be the impact of new emergent technologies on the stakeholders involved in education?
7. What new pedagogies are emerging as a result of the use of new technologies?
8. What are the implications for learners, teachers and institutions of new social and participatory media?
9. How will the processes of supporting learning (design, delivery, support and assessment) change as a result of new technologies?
10. What social exclusion issues are arising with the increased use of new technologies?

11. How are open educational resources being designed, used and repurposed?
12. What are the implications for formal institutions of the increasingly availability of free resources, tools and even total educational offerings, such as massive online open courses (MOOCs)?
13. What digital literacy skills do learners and teachers need to make effective use of these technologies and resources? To what extent are they evident, and how can they be developed?
14. How are the ways in which learners and teachers communicate and collaborate changing with the use of these technologies?
15. How can we create effective new digital learning environments to promote the use of social and participatory media and OER?
16. How can informal learning using OER be assessed and accredited?
17. What kinds of policy directives are in place to promote social inclusion through the use of OER, and how effective are they?
18. What new methodologies and theoretical perspectives will be needed to address these research questions and to interpret the findings?

Conclusion

These are exciting but also difficult times for education. Learners and teachers have a wealth of tools and resources to draw on to support innovative and effective pedagogies. But education is operating in a climate of increasing financial straits, and it is becoming more and more evident that traditional educational offerings are inadequate and do not provide learners with the necessary skills they need to be part of an increasingly complex, globally networked society. Educational establishments therefore, I would strongly argue, must change; the way in which we support and assess learning must change. We need to recognise the implications of social and participatory media and harness their potential. The learning design methodology presented in this book aims to help teachers make effective use of these technologies and to rethink their design practice. We cannot predict the future, but we can say with certainty that technologies will continue to develop at an exponential pace and that change is the norm. Let us see what the future brings.

References

Agostinho, S., Harper, B., Oliver, R., Hedberg, J., & Wills, S. (2008). A visual learning design representation to facilitate dissemination and reuse of innovative pedagogical strategies in university teaching. In L. Botturi & S. T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 380–393). Hershey: Information Science Reference.

Beetham, H., & Sharpe, R. (2007). *Rethinking pedagogy for a digital age: Designing and delivering e-Learning*. London: Routledge.

Conole, C. (2004). E-Learning: The hype and the reality. *Journal of Interactive Media in Education 2004*(12). Available online at http://www-jime.open.ac.uk/2004/12. Accessed 11 Aug 2011.

Conole, G. (2008). Capturing practice, the role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of learning designs and learning objects*. Hershey: IGI Global.

Downes, S. (2007). Models for sustainable open educational resources. *Interdisciplinary Journal of Knowledge and Learning Objects, 3*, 29–44.

Falconer, I., & Littlejohn, A. (2008). Representing models of practice. In L. Lockyer, S. Bennet, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects*. Hershey: Idea Group.

Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing* (pp. 67–82). Hillsdale: Lawrence Erlbaum.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Hillsdale: Lawrence Erlbaum Associated.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Cambridge, MA: Mit Press.

Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century*, MacArthur commissioned report. Available online http://digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF. Accessed 11 Aug 2011.

Katz, R. (2008). The tower and the cloud: Higher Education in the age of cloud computing, an Educause ebook. Available online at http://net.educause.edu/ir/library/pdf/PUB7202.pdf, Accessed 11 Aug 2011.

Koedinger, K. R., & Corbett, A. (2008). Technology bringing learning science to the classroom. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 61–77). Cambridge: Cambridge University Press.

Lockyer, L., Bennett, S., Agostinho, S., & Harper, B. (2008). *Handbook of research on learning design and learning objects*. New York: Information Science Reference.

Masterman, L. (2008). Activity theory and the design of pedagogic planning tools. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications and technologies* (Vol. 1, pp. 209–227). Hershey: Information Science Reference.

Oliver, R. (2000, December 9–12). *Where teaching meets learning: Design principles and strategies for Web-based learning environments that support knowledge construction*. ASCILITE 2000 conference, Coffs Harbour. Available online at http://www.ascilite.org.au/conferences/coffs00/papers/ron_oliver_keynote.pdf. Accessed 11 Aug 2011.

Sawyer, R. K. (2006). *The Cambridge handbook of learning sciences*. Cambridge: Cambridge University Press.

Sharpe, R., Beetham, H., & De Freitas, S. (2010). *Rethinking learning for the digital age: How learners shape their own experiences*. London: Routledge.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. Cambridge: The MIT Press.

Weller, M. (2011). *Digital, networked and open*. London: Bloomsbury Academics.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity. Learning in doing: Social, Cognitive, and computational perspectives*. Cambridge: Cambridge University Press.

Chapter 17
Postscript

Introduction

As I indicated in the first chapter, I adopted an open approach to writing this book, by posting draft chapters online on Cloudworks[1] and my blog.[2] Periodically, I invited the broader research community (via Twitter and Facebook) to comment on them. In this postscript, I want to reflect on this experience and consider the ways in which adopting such open practices might change the nature of academic discourse and scholarship in the future. I felt it was important to practice what I preach, given that a central theme of this book is about adopting open practices in learning, teaching and research. I wanted to share draft chapters I produced and also reflections on writing the book as I went along. This postscript summarises my experience and reflections.

The Initial Idea

The idea for this book has been at the back of my mind for a number of years. In particular, when I presented aspects of our learning design work at conferences in the USA, I would often be asked how this was different from instructional design. After giving an invited presidential lecture at the Association for Educational Communications and Technology (AECT) conference in October 2009, I emailed the AECT President Mike Spector and also Peter Goodyear, the keynote speaker at the conference, asking them if I was mad to think of writing a book on my learning design research work. Peter's response was positive; he thought it was a good idea and that it would be good to put the various works I had written in papers and book

[1] http://cloudworks.ac.uk

[2] http://e4innovation.com

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chapters together into a coherent narrative, to give a sense of the scope and focus of the entire body of my work. Mike came back and invited me to submit a book proposal for a Springer series he was co-editing with Suzanne Lajoie.

So that was the start of it. The process of writing has been a series of stops and starts. Sometimes I would find that I could really get in the flow and write extensively. Other times I found my ideas stagnated, although probably I was mulling ideas around in the back of my head. Comments on drafts of the chapters in March 2011 by Martin Weller were particularly helpful. As a result, I substantially reordered the chapters to address the useful comments and suggestions he made.

The Changing Nature of Academic Discourse

Traditionally, the process of writing research publications has been closed. An author would work on the publication and only submit it when it was in a near-final state. Publication outlets were mainly of two types: (1) conference presentations and (2) peer-reviewed journals and books. Conferences enabled the author to get feedback on the work, whilst a more formal form of feedback was possible through peer review. Once feedback had been received, the author would incorporate comments made and produce a final version for submission. Many peer-reviewed journals unfortunately are still closed, whilst at least conference proceedings are now usually available online. In recent years, many researchers have taken to making their publications available in institutional open access repositories. Some journals are adopting more open approaches, such as IRRODL (the International Review of Research in Open and Distance Learning).[3] The *JIME* (*Journal of Interactive Media in Education*)[4] has an open peer review process, where the reviewers are known to the author and where both engage in an open, online discussion of the draft paper. Having had a paper go through this process (Conole 2005), I found it very constructive and felt that I got much more detailed feedback from the reviewers than in a normal journal and hence that the final article was much better as a result.

The nature of publication is changing. Many researchers now keep a blog, which they use to post reflections and thoughts on their research work and drafts of publications, which can then be commented on by the wider community. Using a blog enables a researcher to reach a far wider audience than publishing in closed journals. The blogosphere has enabled researchers to develop an alternative form of academic discourse (Conole 2007a, b), a more informal, 'of-the-moment' discourse, a stream of consciousness. In contrast, published papers tend to be more coherent stories, weaved around a particular theme. They hide the real life and messiness of

[3] http://www.irrodl.org/index.php/irrodl

[4] http://jime.open.ac.uk/

the actual research process and act as a final narrative. The blogosphere has its own federated peer-reviewing mechanisms, such as cross-referencing between blogs and indicators of esteem such as the Technorati Authority.[5] Increasingly academics are taking note of this new communication space—however, one could argue that the uptake is slower than it should be; arguably in our field, the majority of bloggers are located at the practical or technical end of the spectrum; there are very few of the mainstream researchers blogging at the moment.[6] What are the reasons for this lack of uptake? Firstly, it may be that researchers are fearful of starting a blog, perhaps because they are unsure of what their voice should be. Secondly, they may be fearful that by blogging ideas others can steal their ideas. Thirdly, it may be that they cannot see the benefit of blogging and do not consider it to have the same academic kudos as peer-reviewed articles. In a response to one of my blog posts on these issues, Martin Oliver left this reply:

> Please, don't condemn me to having to wade through pages of people's blogs in order to find the one or two good ideas in there! The prospect of blog entries substituting for slow publication isn't something that thrills me. It has its place, but so does the discipline of shaping ideas in a format that can take a year or more to come to fruition. Distance brings its own perspective, and can help discern what's of lasting value, rather than momentary excitement.
>
> This is why, for all that they are reviled, lectures and presentations can be so helpful. Listening to someone who's thought about a problem for long enough and hard enough to shape a 30–45 minute argument—an argument that actually needs that sustained presentation, not just padding—is quite an indulgence. Think of all the months I would not have to spend thinking, having had someone else do it for me!
>
> By all means, blog away. But I think we'd be in a poorer state if we stopped books and articles. (Conole 2007a)

This demonstrates some of the real concerns researchers have about the blogosphere. However, the reality is that in today's rich technological and connected digital environment, we need to be embracing the power of these tools and using them effectively to widely distribute our research ideas and to engage with others in discussions around these ideas. My response to Martin was:

> To my mind the different forms of communication have different merits and different purposes and certainly for me—formal papers/chapters, conference presentations and blogs are all valuable in their own right. BUT if some academics choose to only blog and some choose to only read 'peer reviewed' journals—where does that leave us??? Conversely as you say has the world just got a level more complicated with yet another communication medium we have to keep up with???

In a related post, I summarise some of the responses to the above post (Conole 2007b). For example, Romeis suggests that blogs report on 'what is happening now', where peer-reviewed papers are 'old news' because of the lag time to publication. McQuillan celebrates the 'stream of consciousness' nature of blogging, sug-

[5] http://technorati.com/

[6] Although there are exceptions such as Terry Anderson, http://terrya.edublogs.org/

gesting that it is a valuable route to publication and that by making thoughts publicly available as they happen they are there and accessible for others to review and provide their perspective on. To conclude, I reflected as follows:

> I do not think a direct comparison of journal papers and blogs is appropriate; people blog for a whole range of reasons not just for academic recognition and institutional 'performance ticking'. I think what we are seeing is a confused transition, whilst we try and work out the co-evolution of tool use and our own working practice (both as individuals and as a society).

But blogs are not the only mechanism for sharing and discussing research ideas. In recent years, researchers are increasingly harnessing social networking sites such as Facebook and microblogging tools like Twitter. My own practice in the use of these has changed over time. I increasingly rely on them as a mechanism for being part of a connected, distributed research community. I use Twitter in particular as a means of keeping abreast of new developments as well as posting pointers to my latest research. There is some duplication of my posts in Twitter and Facebook, but I use the latter more for casual and social exchanges. In addition, I use the social networking site that we have developed, Cloudworks, to live-blog conferences and workshops, to post chapters and draft papers, to participate in question and answer debates about different topics and to aggregate resources and references. Chapter 15 in this book gives a more detailed account of how users are using Cloudworks.

My Experience of Adopting an Open Approach

So what has my experience of adopting an open approach to the writing of this book been? Firstly, I have found it motivating. It has been useful to post draft chapters and great to get useful and insightful feedback from peers. Secondly, however, I have found it nerve wrecking; it has felt like laying my soul bare to the world. I have been concerned that my ideas will appear half baked. But overall I think it has been a valuable process. I have been amazed at the number of views there have been of the individual Clouds and the Cloudscape; there have been over 850 views of the Cloudscape. As I neared completion of the book, I set up a dropbox folder and uploaded the draft chapters and invited those interested to the area. I have been able to update the chapters and incorporate the ideas and suggestions people have provided, which I am sure has enhanced the quality of the writing. In some respects, this has acted as a kind of peer-validated reflection on the work by the wider research community.

Posting draft chapters has enabled me to interact with others. In the book, I have described the work of other researchers in the field, such as Diana Laurillard's work on pedagogical planners and James Dalziel's work on learning activity management system (LAMS). Making draft chapters available offers them the opportunity to check if I am accurately representing their work.

The process of developing my ideas has very much been consolidated through conference presentations and workshops. These provide me with an opportunity to share current thinking and to discuss ideas with peers.

Although the theory of connectivism has mainly being developed and applied in a learning context (Downes 2007; Siemens 2005), arguably it can also be applied to describe what I have experienced in adopting this open approach. In a sense, it is a form of professional connectivism, both in terms of me learning from the comments made by people and in them getting insights from my work and research ideas through the draft chapters. To expand on this, I refer back to the distinction Siemens (2009) makes between connectivism and other learning theories:

1. Learning occurs based on the recognition and interpretation of various patterns in distributed networks enhanced by technology.
2. Factors that influence learning include the diversity of networks, the strength of the nodes and context.
3. The role of memory based on adaptive patterns that is representative of a particular state.
4. The transfer of learning is generated by the addition of nodes and network expansion.
5. Learning becomes complex with a quick change at its core, based on various sources of knowledge.

In terms of the first point, clearly technology has enabled me to be part of a distributed and networked community. I have been able to learn from the comments of others as well as get answers to queries by posting questions on Twitter. I also agree with Weller's argument that Twitter can enable researchers to have access to immediate expertise (Weller 2010), and this has certainly been my experience. I give an example of this in the conclusion to Chapter 11 and show how I received a number of replies very quickly to a question I posed asking for examples of openness and open practices.

In terms of the second point, I am part of an extensive network of researchers across the world. I have over 4,500 followers on Twitter at the time of writing. This means that the chance of someone having an answer to any question I might post is high, as is the likelihood of getting a near-immediate response. I can also offer advice and links as well as use the retweeting functionality to pass on interesting tweets from those I am following across different networks.

Participation in the global network acts as a cognitive repository, which relates to the third of Siemens' points. Essentially this network becomes a part of my distributed cognition (Salomon 1993), enabling me to harness the collective intelligence (Lévy 1997) distributed across my network.

As I become more proficient at working my network, and as it expands to include new people to follow, my learning becomes more adaptive. I have co-evolved with the use of these tools, as I have increasingly embedded them in my everyday practice, and this relates to Siemens' fourth point.

In terms of his last point, my learning is dynamic and changing, feeding off the network of evolving ideas. A tweet might set off a host of new ideas or might lead to me engaging in a meaningful debate with the person who posted it.

Conclusion

Finally, I have found the process of writing this book a valuable experience. It has enabled me to draw together the work I have been doing over the last 10 years or so into a coherent narrative. Therefore, overall my experience has been positive. I truly hope that more and more researchers in our field begin to harness the power of social and participatory media and that we start to see an opening up of research practice and associated academic discourse. It will be interesting to see how the way in which academic work is shared and communicated changes in the future and what the balance will be between traditional publications and academics using social and participatory media more extensively to support their learning, teaching and research activities in the future. I think both have value, the latter for active dialogue and of the moment sharing of ideas and the former for consolidation and peer review. Dialogue has always been at the heart of learning and the co-construction of knowledge. Never before have we had such a powerful set of tools to support peer-to-peer dialogue and the collective shaping of our knowledge and understanding of the world.

References

Conole, G. (2005). E-Learning: The hype and the reality. *Journal of Interactive Multimedia Education*. http://www-jime.open.ac.uk/2004/12/conole-2004-12-t.html. 2004(12). Accessed 7 Oct 2011.

Conole, G. (2007a, October 20). The nature of academic discourse. www.e4innovation.com, blog post. Available online at http://e4innovation.com/?p=45. Accessed 11 Aug 2011.

Conole, G. (2007b, October 29). The paper vs. blog argument. www.e4innovation.com, blog post. Available online at http://e4innovation.com/?p=56. Accessed 7 Oct 2011.

Downes, S. (2007, June 25–26). *An introduction to connective knowledge*. Paper presented at the media, knowledge & education – Exploring new spaces, relations and dynamics in digital media ecologies, Vienna. Available online at http://www.immagic.com/eLibrary/ARCHIVES/GENERAL/BLOGS/S051222D.pdf. Accessed 7 Sept 2011.

Lévy, P. (1997). *Collective intelligence: Mankind's emerging world in cyberspace* (R. Bononno, Trans.). Cambridge, MA: Perseus Books.

Salomon, G. (Ed.). (1993). *Distributed cognitions – Psychological and educational considerations*. Cambridge: Cambridge University Press.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1), 3–10.

Siemens, G. (2009). Open isn't so open anymore. http://www.connectivism.ca/?p=198. Accessed 7 Oct 2011.

Weller, M. (2010, October 6). Twitter as interdisciplinary tool and culture, blog posting. Available online at http://nogoodreason.typepad.co.uk/no_good_reason/2010/10/twitter-as-interdisciplinary-tool-culture.html. Accessed 7 Oct 2011.

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