

Learning design – making practice explicit

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Abstract

New technologies have immense potential for learning, but the sheer variety possible also creates challenges for learners in terms of navigating through an increasingly complex digital landscape and for teachers in terms of how to design and support learning interventions. How can learners and teachers make informed decisions about what technologies to use in the design and support of learning activities? This presentation will consider this question and present a new methodology for design – ‘learning design’, which aims to shift the creation and support of learning from what has traditionally been an implicit, belief-based practice to one that is explicit and design based. Learning design research at the Open University, UK has included the development of a set of conceptual design views, a tool for visualising designs (CompendiumLD) and a social networking site, for sharing and discussing learning and teaching ideas and designs (Cloudworks). An overview of this work will be provided, along with a discussion of the perceived benefits of this new approach to educational design.

Introduction

This paper describes a new methodology (learning design) for designing and reusing learning interventions. It contextualises this in terms of related research work, particularly instructional design, learning sciences, learning objects/Open Educational Resources and professional support networks. It provides a rationale for adopting a learning design approach, which aims to provide a more holistic approach to the design process, taking account of the perspectives and needs of all stakeholders involved in the design lifecycle (the designer, the learner, those involved in facilitating and supporting the learning process, assessment and accreditation of the learning).

The paper cuts across a number of the themes of the ConnectEd conference (<http://www.connected2010.com.au/>). Firstly the theme e-learning and technology in design education, in terms of exploration of how e-learning and technologies can act as a trigger for fostering new and innovative approaches to educational design. Secondly, the theme learning creativity and design and in particular how the learning design methodology outlined specifically aims to help designers take a more creative and holistic approach to design, which goes beyond a focus on content. Finally it touches on the theme design and community development, in particular focusing on the work that we have been doing to harness web 2.0 practices to support community interaction and engagement and to encourage great discussing and sharing of design ideas and examples.

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. That traditional outcomes-based, assessment driven and standardised educational systems and processes do not meet the needs of today's learners (Borgeman, et al., 2008; Beetham and Sharpe, 2007; Sharpe and Beetham. forthcoming). 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 changing nature of society values (including the defragmentation of the family unit, polarised perspectives on secular vs. religion-based beliefs, changing roles for individuals and organisations).

Reigeluth (2009: 390) argues that we have seen a shift from the industrial to 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 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. Within this broader societal context there are a number of specific triggers influencing and shaping the context of modern education. Firstly, 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. Constructivist and dialogic approaches have become more prevalent, with a rich set of empirically based case studies of applications of strategies such as problem-based learning, case-based scenarios and inquiry-based learning. Secondly, over the past thirty 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. As a consequence a body of research around the competences and skills needed to effectively use and interact these new technologies has emerged. Terms such as digital literacies, information literacies, 21st Century literacies have been used, each with subtle nuances and different foci. However fundamentally the central issue is about the literacies needs 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. (2008: 4) have identified twelve skills which they argue are necessary to interact in what they term this new participatory culture, namely – play, performance, simulation, appropriation, multitasking, distributed cognition, collective intelligence, judgment, 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 (pg 4). This is at the heart of the learning design methodology approach outlined here. The aim is to present a more systematic approach to the 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 modern 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. 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 broader design perspective

The central argument of this paper is that adopting a more principled, design-based approach to teaching and learning processes might offer a solution to enabling practitioners to make more informed choices about their creation of learning interventions and better use of good pedagogy and new technologies. Before outlining our learning design methodology, it is important first to consider the broader definition of what is meant by design practice and examples of how it is used in other disciplines.

Design theory refers to identifying methods (or models, techniques, strategies and heuristics) and when to use them. Reiguluth (2009: 7) argues 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 learning design methodology described in this paper aims to facilitate the development of both approaches.

In this paper I want to argue that we need a more formal design language for education, to make more explicit and sharable design intentions and to enable designers and users of designs to understand their context of use, their origins, and their intentions. This section provides a definition for the term design language and provides examples of how it is used in other professional domains.

Design is a key feature of many professions and in terms of specifically exploring the design aspects in an educational context. I would like to first consider design practices in related fields. I focus here in particular on three disciplines: Music, Architecture and Chemistry and describe how design approaches have been developed in each of these. I then summarise some of the key characteristics of design practice that emerge and explore the implications of these in terms of the application of design principles to an educational context.

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 other. Cole, Engestrom and Vasques argue that ‘the Languages used to a great extent shapes what can and cannot be thought and said’ (cited in Gibbons and Brewer, 2005: 113)

Design Languages can be used to both generate designs and as a mechanism for interpreting and discussing them. 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 about 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 artifact. 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: 64).

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.

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 or 400 hundred years ago can be accurately replayed. Early musical notations can be traced back to 2000 BC, but the standard notation used today is a relatively recent phenomenon, before its development, music had to be sung from memory. This severely limited the extend and reach of music, as well as resulting in a loss of fidelity of the original music as they changed from person to person memorising them. Musical notation went through a range of forms before settling on the notations we use today. 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 help articulate and share an Architect's origin vision behind the development of a building and make that explicit and sharable with others involved in the design and development of the building. Buildings are complex and 3-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 of materials, the nature of the surrounding situation of the site. 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. 3-D visual representations are often annotated with text and supplemented by tables of data. In recent years design representations in Architecture have being computerised with the emergence of sophisticated Computer Assisted Design tools. Arguably use of these CAD tools have influence the practice of design, in addition to facilitating more effective sharing of designs.

Chemists used 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. As with music and architecture the design representations that have been developed closely mapped to the discipline itself and the key focus of interest. So chemistry is fundamental concerned with the properties and chemical behaviours of individual atoms and how these can combine in different ways to create molecules with different properties. 2-D representations are common (for example chemical equations) but 3-D 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 individual atomic coordinates of individual atoms and so are also powerful modelling tools.

Gibbons and Brewer (2005: 121) argue that once a notational system is established it can become i) a tool for remembering designs, ii) a structured problem-solving work space in which designs can take form and be shared, iii) a kind of laboratory tool for sharpening and multiplying abstract design language categories. Indeed in the examples cited above 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. 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: 115) list a set of dimensions of design languages. The first is complexity, namely that design are 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 as described later, in particular in the specification of formal technical learning designs that can be translated into machine-readable code and 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 sharable 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 which 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 sharable designs requires a change of mindset and practice. Related to this are issues around standardisation vs. non-standardisation. In terms of these points, there is a tension with designs in terms of how much they focus on precise presentation, 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 so formalised and precise that they can be converted into machine runnable code. Gibbons and Brewer (2005: 118) go on to argue that designs can be shared in two ways i) by a description that relies on natural language or ii) 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; i.e. a design carries with it a socio-cultural element – the background and context, both of the individual and the educational setting. Secondly the inherent beliefs of the designer; i.e. a design carries with it intentions, aspirations and beliefs. In a learning content this is the designer’s beliefs about what should be learnt and how it should be achieved. Donald and Blake (2009) see this inherent belief basis of teaching practice as a vital tool for unlocking and shifting practice. 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.

Approaches to promoting good teaching practices

Having described design practice in a number of fields, this section 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 this section aims to give a flavour and overview of some of the approaches, before introducing learning design as an alternative approach. It is important to note that learning design as a methodology does not seek to replace these existing approaches, but instead intends to draw on them, but within a specific theoretical framework which focuses on the mediating artefacts used in learning and teaching. Learning design is intended to be a holistic approach, covering all stakeholders involved in the learning and teaching process.

The approaches discussed in this section are:

- Instructional Design
- Learning Sciences
- Learning Objects and Open Educational Resources
- Professional networks and support centres

Instructional Design

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’ (InstructionalDesign, nd). Reiser (2001a) 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’. He identifies two practices that form the core of the field, i) the use of media for instructional purposes, ii) the use of systematic instructional design processes (Reiser, 2001b).

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

Van Merriënboer and Boot (2005: 46) describe Instructional Design as an analytical pedagogical approach. This includes the development and evaluation of learning objectives. A key milestone was Bloom’s Taxonomy of Educational Objectives (Bloom, 1956; Anderson and Krathwohl, 2001). In 1965 Gagné 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. 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 in to 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, i.e. thinking systemically about instruction and seeing teachers, learners, content, etc. as components of a larger system.

Of particular note in the field is the work of David Merrill, who through a review and analysis of instructional design theories and methods devised a set of first principles for design (Merrill, 2009: 43); namely that learning is promoted where learners

1. engage in a task-centred instructional strategy (Task-centred Principle)
2. activate relevant prior knowledge or experience (Activation Principle)
3. observe a demonstration (Demonstration Principle)
4. apply the new knowledge (Application Principle)
5. integrate their new knowledge into their everyday world (Integration Principle).

The principles were an attempt to identify the fundamental principles of good instructional design. The central focus is on the tasks that the learners do, through activation, demonstration, application and integration. The principles have been extensively quoted and many of the models that have been subsequently developed explicitly map to them. 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.

Learning Sciences

Learning Sciences is an interdisciplinary field which emerged in the mid-nineties (Sawyer, 2006). It developed in part as a backlash against traditional notions of education, focusing on instructionism (Papert, 193 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: 242) defines instructionism as ‘learning by telling and emphasizes delivery of content; in contrast, constructionist approaches emphasize 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, Brown and Cocking, 2000). Sawyer lists five key influences that underpin learning sciences: constructivism, cognitive science, educational technology, socio-cultural 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 nineties, with the promise of creating digital resources which could be shared and reused. The term is contested and has been used to describe everything from raw 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: 2). They usually consist of three parts: educational objectives, instructional materials and an assessment component. Littlejohn et al. (2008) identify four levels of granularity: i) digital assets – a single file, raw media asset, ii) information objects – structured aggregation of digital assets, iii) learning activities – tasks involving interactions with information to attend a specific learning outcome, iv) learning design – structure sequences of information and activities. A considerable body of research has been done into the development of tools for the creation and storing of Learning Objects. However despite the vision in terms of their potential to development 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. Supported by organisations such as the Hewlett foundation and UNESCO, the vision behind OER is to create free educational resources that can be shared and reused. Wiley (2009: 362) argues 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’. He goes on to state that OER have unlocked a new set of issues for design, namely those around how to repurpose resources for different local context, 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 a gateway to other learning object repositories. (<http://globe-info.org/>). The Reusable Learning Objects centre (<http://www.rlo-cetl.ac.uk/>) aims to design, share and evaluate learning objects and has produced a tool, GLO Maker for creating Learning Objects (<http://www.glomaker.org/>). 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, 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) and a tool for visualisation (Compendium) (<http://openlearn.open.ac.uk>). 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 practices (<http://lemill.net/>). Similarly, Connexions provides a space for educators and learner to use and reuse OER (<http://www.oercommons.org/community/rice-university-connexions>). Carnegie Mellon, through its Open Learning Initiative (<http://www.oercommons.org/community/rice-university-connexions>), adopts a more evidence-based approach. Finally, Carnegie Mellon and the Open University in the UK are developing a global network of support for researchers and users of OER, through Olnet (<http://olnet.org/>). 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 reused. As such some 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 developed approaches to improve the uptake and reuse of the OER. This is the central focus of the OPAL project (<http://oer-quality.org/>), work to date has included a review of 60 case studies of OER initiatives and from these abstracted eight dimensions of Open Educational Practice (<http://cloudworks.ac.uk/cloudscape/view/2087>).

Professional networks and support centres

Finally, it is worth mentioning that over the past ten 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 (for example the Associated for Learning Technologies), others are either focused on educational practices or subject disciplines (for example the Higher Education Academy subject centres). In addition it is relatively common now for institutions to have some form of specialist unit concerned with promoting good approaches to teaching and learning practice and to helping practitioners think about how they can use technologies more effectively. 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 virtual 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.

Learning design

Learning design as a research field has emerged in the last ten years or so, primarily driven to date by researchers in Europe and Australia. Before describing the methodology we have developed at the Open University, I will provide a brief overview of the development of the field and some of the key features/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 (Conole, 2004; Herrington et al., 2005; Bennett et al., 2007). 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. Lockyer et al. (2008) and Beetham and Sharpe (2007) have produced edited collections on work in this area. A closely related body of work to learning design is research into the development and use of pedagogical patterns. Derived from Alexander's work in Architecture, pedagogical patterns is an approach to developing structured case studies of good practice (See for example Goodyear, 2005 for an outline of the field).

Arguably the origins of the term can be traced back to work at the OUNL in the Netherlands in terms of the development of a Learning Design specification, which subsequently translated into the IMS LD specification (see <http://www.imsglobal.org/learningdesign/>). From a review of learning theories an Educational Modelling Language was developed (Koper and Manderveld, 2004) and from this a Learning Design specification (see for example Koper and Oliver, 2004). 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 interventions. The specification was based on a theatrical metaphor, describing the roles of those involved in the intervention, 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, i.e. 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 learning can be achieved in a particular context. Koper and Oliver (2004: 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'. It specifies the teaching-learning 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.

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 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 (Oliver, et al., 2002, AUTC, nd, Agostinho, 2008). The work was based on a framework for describing learning designs developed by Oliver and Harrington (Oliver, 1999, Oliver and Harrington, 2001). This was based on three critical elements: learning tasks, learning resources and learning supports. The intention was that thinking about and making explicit each of these elements helped to both guide the design process and make it explicit. The approach as 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) focussed on the ‘Predict, Observe, Explain’ design 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, i.e. that they provide adequate information that can be easily understood in terms of content and thus potentially reused by a teacher in their particular educational context. Their findings were that there are three important features of an effective learning design description: i) a clear description of the pedagogical design, ii) some form of ‘quality’ rating, and iii) guidance/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. 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: 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, 2005). The Mod4L project explored what different types of design presentations were being used by practitioners and concluded that de-contextualised 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, 2008) and the London Pedagogical Planner. The programme divided the design lifecycle into four parts: design, instantiation, realisation and review. The granularity of the designs ranged from the design of learning objects or short learning activities up to broader sessions or whole courses/curricula. Some of the key lessons from the programme included the following. Design practices are varied, depending on

individuals, subject differences and local cultures. Design tools are rarely perceived as pedagogically neutral and most are not considered flexible enough to match real practice. There were mixed views on what were the most appropriate ways of representing and sharing designs – some wanted rich, narrative representations, others wanted bite-sized representations that could be easily reused.

Origins of the OU Learning Design Initiative

The OU Learning Design Initiative emerged from previous work on the development of a learning design toolkit, DialogPlus (Fill and Conole, 2008). Like the Phoebe and the LPP tools, DialogPlus was intended to act as a step-by-step guide to enable teachers to create learning designs. 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 funded from the OU. The intention was to derive a more practice-focussed 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) was being used (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). The interviews focussed on five main questions: i) process: how do teachers go about designing a course?, ii) support: how do they generate ideas?, iii) representation: how do they represent their designs?, iv) barriers: what barriers do they encounter?, v) evaluation: how do they evaluate the effectiveness of the design?

A range of approaches to design were evident, 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. A variety of representations were mentioned from simple textual representations or lists through to more complex and connected mindmaps. 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 and an OU-specific issue in terms of the difficulty of melding together 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 were 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 around the following questions:

- How can we gather and represent practice (and in particular innovative practice) (capture and represent 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 (support learning design)? (Conole, 2009).

We have 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, i.e. 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 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.

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 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 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?

A design-based research methodology

We are adopting 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. Design-based research 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 (2005:5-6) 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’. Reigeluth and An (2009:378-379) articulate the following set of characteristics of DBR:

1. It is driven by theory and prior research. In our work, as described above we are building on the substantive body of prior research on instructional design, learning sciences, learning objects/Open Educational Resources and more recently learning design. The approach we adopt is socio-cultural in nature, with a focus on the design and use of a range of mediating artefacts involved in teaching-learning 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 in actual practice, by practitioners 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. 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 Hannifin (2005: 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.

The main components of the OU Learning Design methodology

In essence we are focusing on three aspects of design: i) the development of a range of conceptual tools to guide the design process and provide a means of representing (and hence sharing) designs, ii) 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, iii) the development of collaborative tools – both in terms of structures for face-to-face events such as workshops and use of digital tools to foster communication and sharing. For each aspects we have now developed a set of tools, resources and activities and over the last two 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 paper 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 (<http://cloudworks.ac.uk/cloudscape/view/1882>). 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, 2010a).

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 main aspects to the work we are doing:

1. Conceptualisation – the development of a range of conceptual tools to help guide the design decision-making process and to provide a shared language to enable comparisons to be made between different designs.
2. Visualisation – use of a range of tools to help visualise and represent designs.
3. Collaboration – mechanisms to encourage the sharing and discussing of learning and teaching ideas.

In terms of conceptualisation we have developed a range of tools to help guide the design process. One of the key aspirations is to enable teachers to shift away from a focus on content and subject matter to thinking more holistically and laterally about the design process. The conceptual tools are also designed to promoting thinking on adopting different pedagogical approaches and using technologies effectively. To illustrate this five conceptual tools are described here:

- The Course View
- The Course Dimensions view
- The Pedagogy Profile
- The Learning Outcomes view
- The task swimlane view

In addition two data-driven views have been produced, one giving an indication of the cost effectiveness of the course, derived from finance data about the course and one giving an indication of the course performance, derived from student and tutor survey data and information on course retention and progression.

The course view map 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’, ‘Content and Activities’, ‘Communication and Collaboration’ and ‘Reflection and Demonstration’.

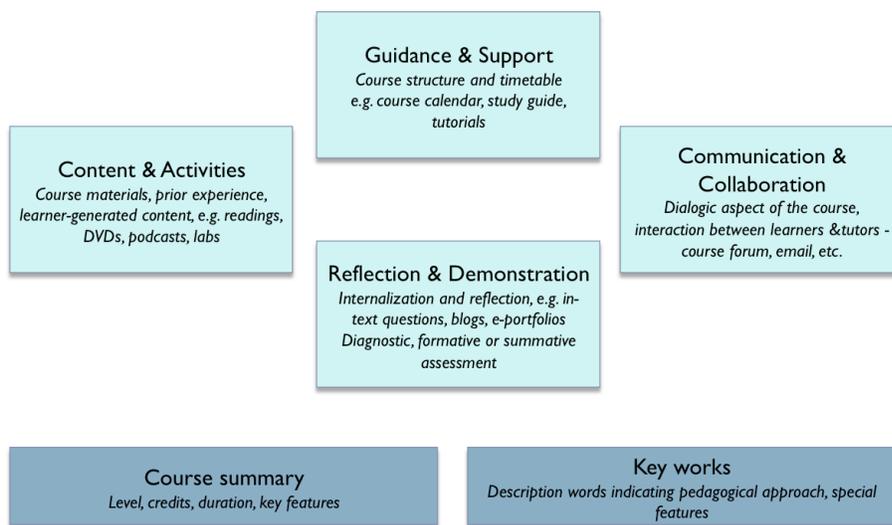


Figure 1: The Course view

The second is a refinement of the course map. **The Course dimensions view** gives a better indication of the nature of the course and how it is supported. For example, it indicates to what extent the course is online, how much it is tutor-guided and the amount of collaborative or activity-based activities are included.

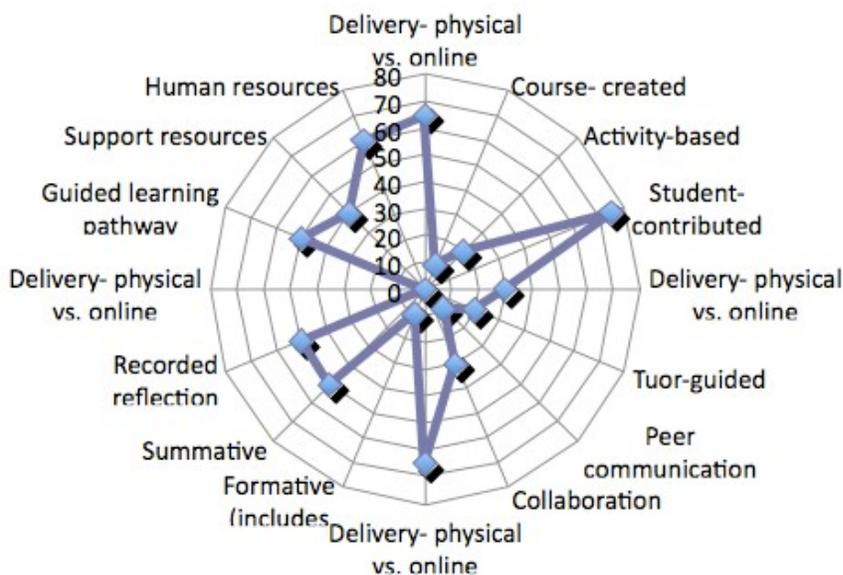


Figure 2: The Course Dimensions view

The third view, the Pedagogy Profile, looks at the balance of the types of student activities (See Conole, 2008 for the full learning activity taxonomy this is based on). These are:

- **Assimilative** (attending and understanding content)
- **Information handling** (gathering and classifying resources or manipulating data)
- **Adaptive** (use of modelling or simulation software)
- **Communicative** (dialogic activities, e.g. pair dialogues or group-based discussions)
- **Productive** (construction of an artefact such as a written essay, new chemical compound or a sculpture)
- **Experiential** (practising skills in a particular context or undertaking an investigation).

- In addition the tool looks at the spread of **assessment** across the course

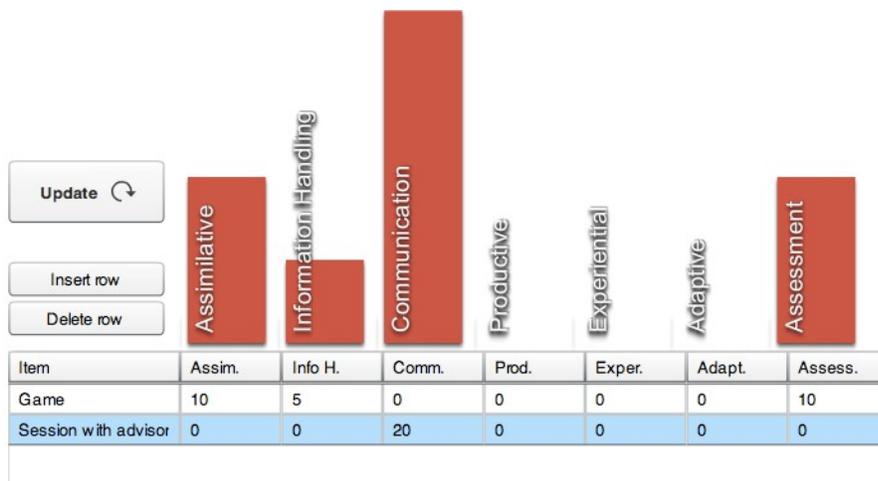


Figure 3: The Pedagogy Profile

The Learning Outcomes view enables the teacher to judge to what extent there is constructive alignment (Biggs, 1999) with the course, i.e. it looks at how the learning outcomes map to the student activities and to the assessment tasks.

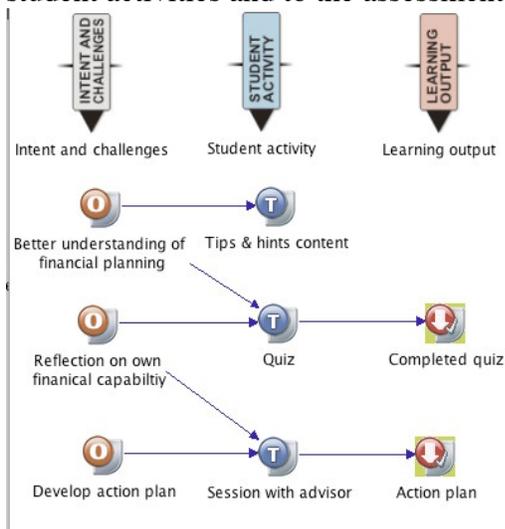


Figure 4: The Learning Outcomes view

Finally, the task swimlane view enables a teacher to map out the details on an individual learning activity; indicating what the student is doing when and what tools and resources they are using.

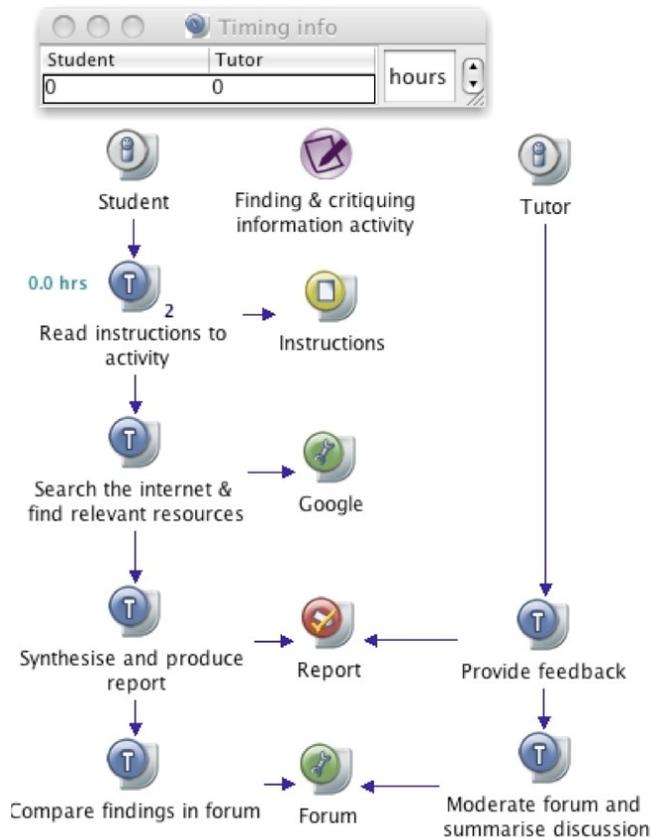


Figure 5: The Task swimlane view

To demonstrate the use of these views on real courses, the following four figures are for the KE312 course 'Working together for children' (Level 3, 60 points). Two of the conceptual views (the course map and pedagogy profile) are shown, along with the two data-driven views on cost effectiveness and course performance. We think the real power in these views will be through modeling across the views and looking at the impact different design decisions have on cost effectiveness and course performance. As part of a current strategic initiative (the Course Business Models project), we intend in the next year to build up a repository of views across the Open University. We have gathered around twenty to date, which we shared with staff from across the University at a workshop in May 2010. Feedback overall on the views was very positive and there was a general consensus that embedding these views in our institutional systems and processes has the potential to make design decisions more effective and will encourage the application of more innovative approaches. This builds on a detailed mapping of our curriculum systems and processes (Mundin, 2009), which concluded that the focus was primarily administrative in nature and there was little focus on pedagogy and design. The intention is to embed the design views described here at key trigger points in the curriculum process, so that a shared design language can be developed across the different stakeholders involved in learning and teaching (course teams, tutors, learners, developers and support staff).

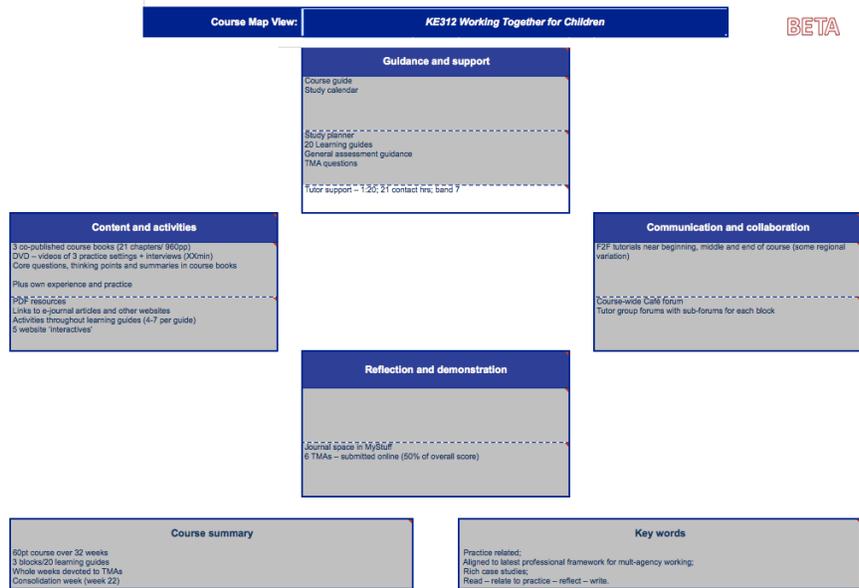


Figure 6: The course map for KE312, completed as an excel spreadsheet

Pedagogy Profile Tool

KE312 Working Together for Children

Total Hours: 365

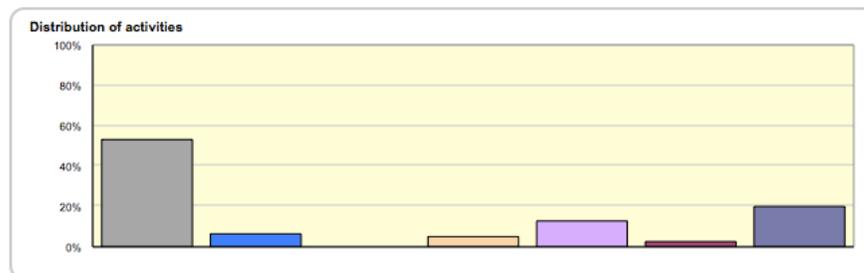


Figure 7: The pedagogy profile for KE312, completed as an excel spreadsheet

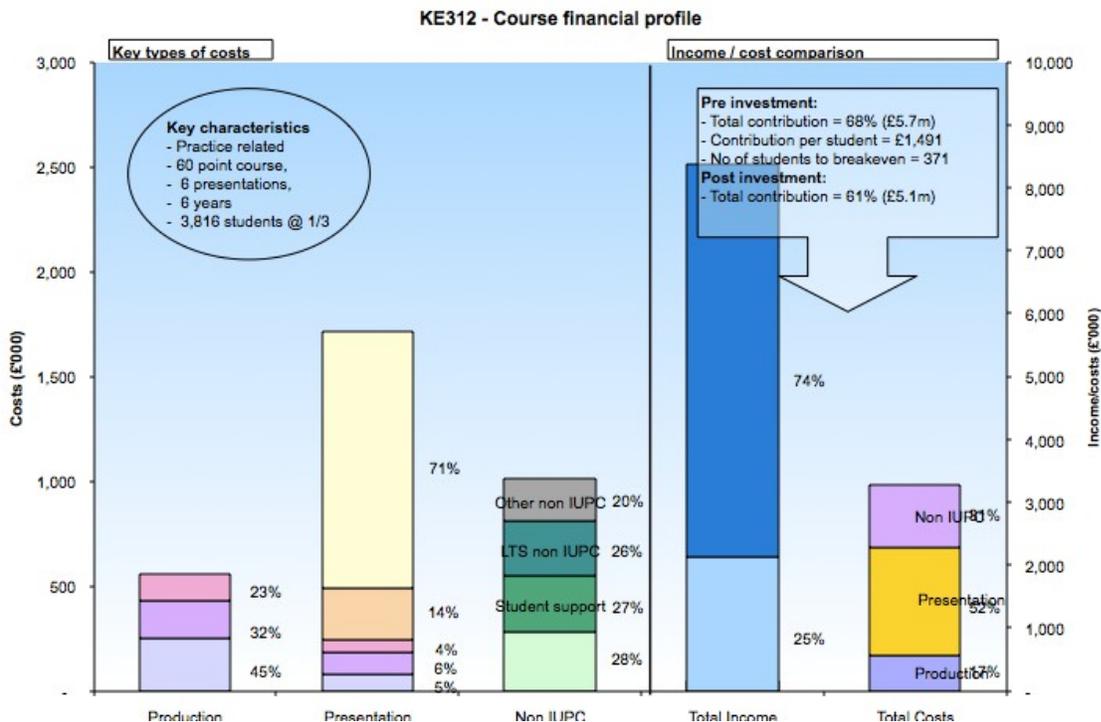


Figure 8: The cost effectiveness view for KE312

Course Business Models: Course Performance View	
Basic Course Data	Basic Course Statistics (2009B)
Course code: KE312 Course title: Working together for children Pres code for latest survey data: 2009B Pres code for all other statistics: 2009B	Registration Start: 100% (694) Registration Third*: 99% (687) Completion: 79% (551) Pass: 71% (493)
Student Demographics at Start* (2009B)	Student Survey Results (2009B)
New or Continuing Students New: 11% Continuing: 89%	Survey sample size: 353 Response rate: 33%
Financial Assistance Yes: 34% No: 66%	Agreed OU Avg*
Gender Female: 93% Male: 7%	Overall course quality: 88% (85%) Overall study experience: 83% (83%) Value for money: 75% (74%) Support provided: 71% (79%) Teaching materials: 84% (84%) Workload over expected*: 19% (22%) Stated learning outcomes: 87% (85%) Recommend to others: 78% (76%) Met expectations: 77% (78%) Enjoying studying: 77% (77%)
Socio-Economic Group (SEG) (where known) Low: 12% High: 88%	KEY Definitely agree (Green), Mostly agree (Light Green), Neither (Yellow), Mostly disagree (Light Red), Definitely disagree (Red)
Previous Educational Qualifications (where known) A-Levels O.E.: 36% Higher Ed.: 38% No formal/below A-L: 26%	Notes * Notes both on specific definitions and general background information can be found on the following webpage: http://iet-stats.open.ac.uk/reports-and-analysis/c-bus-models.cfm
Ethnic Group (where known) Black & Minority Ethnic: 11% White: 89%	<small>NEJ Student Statistics & Survey Team, IET, May 2010</small>
Disability (where known) Yes: 7% No: 93%	

Figure 9: The course performance view for KE312

As part of our work on representing pedagogy we have developed a visualisation tool (CompendiumLD) for designing learning activities (Conole et al. 2008). CompendiumLD is a type of mindmapping or concept mapping tool that can be used to design a learning activity. In

addition we have been using an Excel spreadsheet as a means of capturing and representing these conceptual views. However the power of the conceptual tools is that they work equally well as discussion points or as simple pen and paper exercises. In essence they are Mediating Artefacts to guide thinking and foster dialogue.

We have also developed a social networking site (<http://cloudworks.ac.uk>) for sharing and discussing learning and teaching ideas. Cloudworks is a powerful new form of social networking tool: particularly suited for sharing, debating and co-creation of idea (Conole and Culver, 2010). The site combines a mix of Web 2.0 functionality and enables new forms of communication and collaboration and cross-boundary interactions between different communities of users. The core object in the site is a ‘cloud’, which can be aggregated into community spaces called ‘cloudscapes’. In the Cloudworks site a cloud can be anything to do with learning and teaching (a description of a learning and teaching practice, an outline about a particular tool or resource, a discussion point).

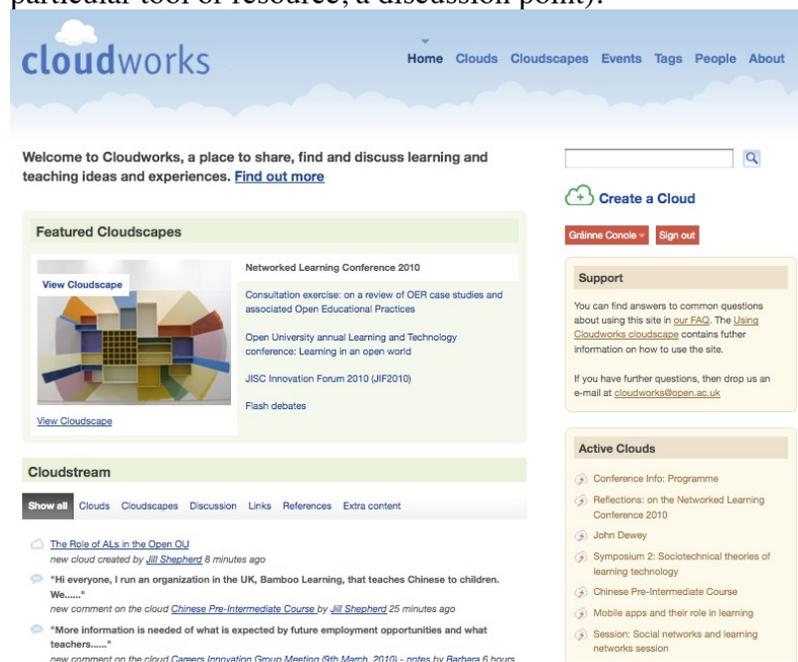


Figure 10: The Cloudworks homepage

Clouds combine a number of features of other Web 2.0 technologies. Firstly, they are like collective blogs, i.e. additional material can be added to the cloud, which appears as series of sequential entries under the first contribution. Secondly, they are like discussion forums, there is a column under the main cloud where users can post comments. Thirdly, they are like social bookmarking sites, i.e. links and academic references can be added. Finally they have a range of other functionalities common on Web 2.0 sites, such as ‘tagging’, ‘favouriting’, RSS feeds, the concept of following, and activity streams. Collectively these features provide a range of routes through the site and enable users to collectively improve clouds in a number of ways. The homepage of the site, in addition to providing standard navigation routes (such as browsing of clouds, cloudscapes and people and searching), lists currently active Clouds and five featured Cloudscapes. All recent activities on the site (newly created clouds and cloudscapes, comments, additions, etc) are listing in a site cloudstream. Although the first use of the tool has been to support educators, it could be used to support any communities wanting a space to share and discuss issues and ideas. The site was launched in July 2009 and now has had more than 60,000 unique hits from 165 countries. One of the most power features of the site is that it

facilitates boundary crossings between communities, enabling different stakeholders (policy makers, researchers, teachers, learners, etc.) to interact in unanticipated ways.

One of the key distinctive features of cloudworks and its advantage over other social networking sites is the way it enables and facilitates not only connections within communities but between them. It enables crossing of boundaries between communities. There is something distinctive about the general layout/functionality of clouds – which in essence are a kind of mix of collective blog, discussion forum, social bookmarking, addition of links and embeds. This mixed functionality seems to be promoting new and interesting forms of social interaction. It has a genuine global reach with different kinds of stakeholders. For example in the current site researchers are interacting with teachers, policy makers, learners, etc. A core principle of the site is that it is totally open, anyone can see anything in the site. This means it has genuine global reach and ensures that it harnesses the best of web 2.0 practices and affordances. Serendipity has been built into the site in a variety of ways, this enables individuals to cross community boundaries and make unexpected connections. The site offers powerful mechanisms for supporting social networks in a range of ways and at different levels.

The site already has a rich set of web 2.0 functionality; such as collective improvement of clouds via additional content, tagging, links and academic references, embedding of different types of content (such as blogs, video clips, voxpops etc), sequential discussion space, activity streams called cloudstreams (for the whole site, individual cloudscapes, and individual users), functionality to ‘follow’ people – their activities on the site then appear in a personalised cloudstream, voting and recommender tools, a personalised bookmarking feature ‘My Favourites’, and automatic embedding of Twitter streams on cloudscapes. There are multiple routes through and ways of connecting, so that individuals can personalise the use of the site to their own preferred ways of working. We now have a dynamic and self-sustaining community, with the emergence of individual champions and local colonisation of sections of the site. We have a lot of experience now as to how to foster and build this form of self-sustainability. One of the rich features of Cloudworks is the way in which there is a mixture of different types of activities occurring in the same space – events, reading groups, flash debates, online consultations, online research reviews.

An open source version of the site will be available by the end of August 2010, which means it can be customised and the benefits of being part of the wider Cloudworks development community. We have a proof of concept working in terms of embedding Google gadgets, two have been developed so far: People recommender and a Cloud recommender. An Applications Profile Interface is currently being developed, which will mean that data can be passed between the Cloudworks site and other social network sites.

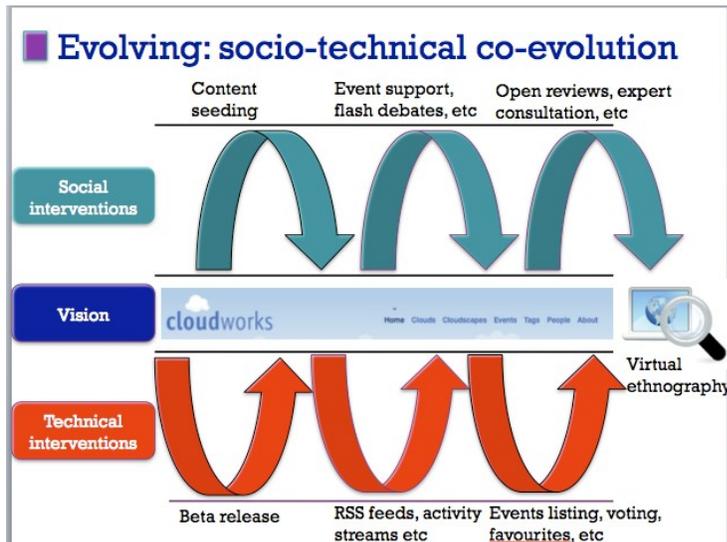


Figure 11: The approach to development and evaluation of Cloudworks

The site has been developed through a process of socio-technical co-evolution. In essence two parallel strands of intervention are ongoing – one technical and one social. Alongside this we have put in place a reach virtual ethnographic approach to evaluation of the use of the site and identification of emerging user behaviours.

Use and development of the site is being monitored in a number of ways (Conole and Culver, 2010). Data collection has included web stats and Google analytics, analysis of site activities and discussions, collation of references to Cloudworks elsewhere (such as in the blogosphere and Twitter), and use and evaluation of the site at numerous workshops and conferences. A Cloudworks questionnaire is also available online. This multi-faceted evaluation strategy has gathered data that has then been used to inform the next design phase, thus ensuring an alignment between technical developments and user needs. The data, and particularly the user feedback, has given us a rich understanding of how the site has evolved and how it is being used. At key points we have commissioned an expert review of the site and have to date undergone three site redesigns, commissioning an expert external designer.

A range of standard statistics is gathered routinely, along with an administrative Cloudstream, which in addition to listing activities on the site chronologically (in the way that the main site Cloudstream does), it also documents when new users register with the site (the site is open, but users need to register if they wish to post anything or create Clouds or Cloudscapes) and when users choose to ‘follow’ others. We will also be capturing on a 6 monthly basis: the number of users who have posted clouds, the number of users who have posted comments, and the number of unique users posting a cloud or comment in last 60 days. To measure sustainability and longevity of contribution, we are also capturing: the number of registered users who have posted a cloud or comment at least one month after registration (this way we don’t count the initial use of the site for say a conference or workshop) and the number of registered users who have posted a cloud or comment at least a year after registration.

Table 1: Statistics

Aspect	Everyone	Team	Non-team
Cloudscapes	289	100	189
Clouds	2408	1214	1194
Comments	3414	1012	2402
Links	3268	1678	1590

The site is also linked to Google analytics, which shows the growth of the site since its launch in July 2009. As is evident with other Web 2.0 sites, the number of active contributors to the site (currently 2376 registered) is less than the number of unique visitors (63, 118 visits from 165 countries). The top five countries are UK, United States, Canada, Australia and Italy).

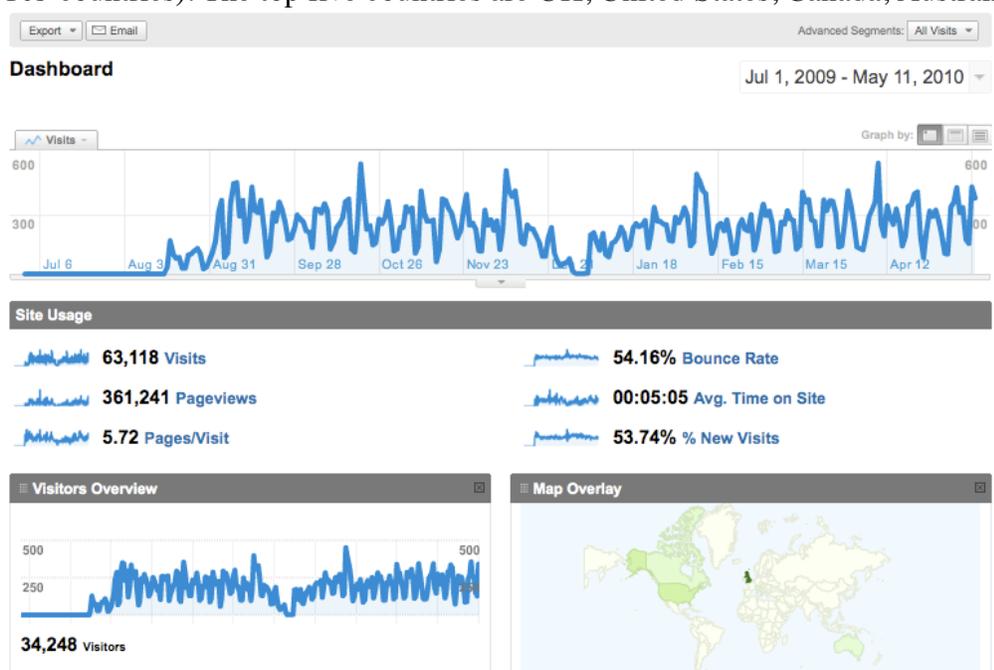


Figure 12: Google Analytics

We have also undertaken a number of qualitative studies of the use of the site; including explorations around how the site is being used by a particular community or theme and through a series of interviews with users. Alevizou et al. (2010) describe the range of theoretical frameworks that are being used to guide the design and analysis of the site. Galley has developed a Community of Indicators framework as a mechanism of analysis interactions on the site and has used this as the basis for undertaking a series of case study evaluations of the site (Galley et al, 2010).

Conclusion and future research plans

The paper has introduced a new methodology for helping practitioners to make more design-based decisions about the creation and support of learning interventions. It has contextualized this in related research fields. Examples of some of the tools, resources and activities that have been produced as part of the OU Learning Design Initiative have been described. The work is part of a broader programme of activities at the OU, Learning in an Open World. The programme is exploring the question: “What is likely to be the impact of an increasingly ‘open’ technologically mediated learning environment on learning and teaching in the future? In a

world where content and expertise is increasingly free and where services are shifting to the 'cloud', what are the implications for education? We are taking a particular position on the notion of "openness"; considering it from a broad perspective covering four major phases of the academic lifecycle: 'open design', 'open delivery', 'open evaluation' and 'open research' (Conole, 2010b). Findings from the research to date are promising, indicating that this is a fruitful area for development. However it is clear that there are also a number of challenges associated with this work. More needs to be done to consolidate the theoretical basis for the work and to identify which methodological approaches are going to be most fruitful.

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