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Using learning design as a framework for supporting the design and reuse of OER

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Abstract: The paper will argue that adopting a learning design methodology may provide a vehicle for enabling better design and reuse of Open Educational Resources (OERs). It will describe a learning design methodology, which is being developed and implemented at the Open University in the UK. The aim is to develop a 'pick and mix' learning design toolbox of different resources and tools to help designers/teachers make informed decisions about creating new or adapting existing learning activities. The methodology is applicable for designers/teachers designing in a traditional context – such as creation of materials as part of a formal curriculum, but also has value for those wanting to create OERs or adapt and repurpose existing OERs. With the increasing range of OERs now available through initiatives as part of the Open Courseware movement, we believe that methodologies, such as the one we describe in this paper, which can help guide reuse and adaptation will become increasingly important and arguably are an important aspect of ensuring longer term sustainability and uptake of OERs. Our approach adopts an empirically based approach to understanding and representing the design process. This includes a range of evaluation studies (capturing of case studies, interviews with designers/teachers, in-depth course evaluation and focus groups/workshops), which are helping to develop our understanding of how designers/teachers go about creating new learning activities. Alongside this we are collating an extensive set of tools and resources to support the design process, as well as developing a new Learning Design tool that helps teachers articulate and represent their design ideas. The paper will describe how we have adapted a mind mapping and argumentation tool, Compendium, for this purpose and how it is being used to help designers and teachers create and share learning activities. It will consider how initial evaluation of the use of the tool for learning design has been positive; users report that the tool is easy to use and helps them organise and articulate their learning designs. Importantly the tool also enables them to share and discuss their thinking about the design process. However it is also clear that visualising the design process is only one aspect of design, which is complex and multi-faceted.

Keywords: Learning Design, mind mapping.

1   Introduction

Research and development activities around OERs and associated issues have increased dramatically in recent years. The Open Courseware movement is now worldwide, exemplified by flagship initiatives such as MIT OCW, OpenLearn and Japan OCW. Downes (2007) notes that there are numerous arguments being put forward for their benefits and application and many believe that the inherent philosophy of open courseware – freely available educational content – is a core value for modern day education. However, the development of OERs also raises a set of fundamental challenges. Hylén (2006) discussing some of the opportunities and challenges associated with OERs raises three main challenges: the lack of awareness of copyright issues, quality assurance and sustainability. This paper argues that an additional and arguably equally core challenge to the successful uptake of OERs is how OERs are designed. We believe that part of the lack of uptake of

OERs is because teachers lack the necessary design skills to be able to take and adapt the materials. Cantoni (2008), quoting from a recent evaluation of the MIT OCW, notes that only 26% of the users are teachers wanting to take and adapt the materials. The majority of the users of the MIT OERs are either self-directed learners or students on formal course, using the materials as a complement to their recommended course materials.

This paper describes a project at the Open University which is focusing on the design process, which aims to create a Learning Design toolbox to help designers/teachers in creating or adapting educational resources. The paper argues that adapting such a learning design methodology is an important means of enabling the uptake and repurposing of OERs. We report on the work we are doing to develop a suite of resources and tools to support the design process, collated into an evolving toolbox for design. This includes a learning design tool (CompendiumLD) we are developing which helps users to articulate and visualise their design process. We believe this tool and the LD toolbox more generally can help to address the last two of Hylén's OER challenges – namely quality assurance and sustainability – by making the design process more explicit, by providing appropriate support and guidance and by working towards developing a self-sustaining community of users.

2   A Learning Design toolbox to tackle lack of uptake and reuse

We have previously argued that there is a gap between the *potential* of technologies to support learning and the reality of how they are *actually* used and that this is due to a lack of understanding about how technologies can be used to afford specific learning advantages and to a lack of appropriate guidance at the design stage (Conole *et al.* 2007, Conole 2008a). This paper puts forward a potential solution to these issues and outlines the basis for a learning design methodology which might be adapted and applied in an OER context. It describes a project which is exploring the design for learning issues within a distance learning institutional context, the UK Open University. The initial focus of the work is reported elsewhere (Conole *et al.*, 2007, Conole, 2008b), demonstration of adapted tool and a more detailed description of its functionality are due to be presented at two forthcoming conferences (Conole *et al.*, 2008c, 2008d). This paper will focus on how we are using CompendiumLD as a tool for aiding the design process and consider this in relation to its value as a tool for developing and reusing OERs.

Our goal is to build on recent research on learning design (see for example Beetham and Sharpe, 2007; Lockyer *et al.*, forthcoming) to develop a tool that provides support in the course design process with an emphasis on the use of technology-enhanced learning. Learning design refers to the range of activities associated with creating a learning activity and crucially provides a means of describing learning activities.[1] Our goal is to collate a wide range of tools and resources to provide support and guidance for designers/teachers creating new learning activities. These will be presented as a Learning Design toolbox, so that users can adopt a 'pick and mix approach' to choice of resources and tools suited to their individual needs, level of expertise and personal preferences. The toolbox will include examples of how others have created learning activities, case studies of practice, design tools and different ways of visualising and thinking about the design process. Users of the LD toolbox would include both course teams as well as others involved in the design process such as learning technologists or those tasked with helping course teams translate their ideas into technical solutions. The LD toolbox will act as a bridge between good pedagogic practice and effective use of new technologies.

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[1] We are aware of the long history of work in Instructional Design but believe the term 'learning design' better describes the methodology and approach we outline which is inherently holistic and contextualised in nature. See Conole, forthcoming for more detail.

3   The OU Learning Design project

Design is inherently a creative and messy process, dependent on a rich range of interconnected factors so no one approach to providing support for design is likely to meet the needs of all users. However with the plethora of technologies now available and a equally large number of potential ways in which technologies can be used in education, teachers can no longer rely on tacit knowledge and past experience as a means of guiding their design process; it is no longer possible for them to be experts in all the possibilities. We believe that there is now a need for a more formal Learning Design methodology to help guide teachers in creating new learning activities. We have identified six main reasons why adopting a learning design approach is beneficial (Conole *et al.*, 2007):

- 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.

- It provides a means by which designs can be reused, as opposed to just sharing content.

- It can guide individuals through the process of creating new learning activities.

- It creates an audit trail of academic design decisions.

- It can highlight policy implications for staff development, resource allocation, quality, *etc*.

- It aids learners in complex activities by guiding them through the activity sequence.

We are adopting an iterative methodology focusing on two areas of activity in parallel: a) capturing and representing practice – through user consultation and case studies and b) supporting learning design – through the development of a visualisation tool for design (CompendiumLD), an online LD toolbox of resources, designs and other LD tools, a series of workshops and a set of LD briefing papers (http://e4innovation.com/?page_id=13). Therefore part of our philosophy is to gather evidence to better understand the ways in which designers/teachers currently go about creating learning activities, what kinds of support they use and where they have problems and need additional help. The resources we are collecting for the LD toolbox, includes case studies and examples of how others have used technologies in their teaching, tools to guide users through creating learning activities, different approaches and methods for thinking about the design process, and innovative approaches to thinking about the application of technology in a learning context. These external resources and tools are being collated into social networking site (CLouDworks), the intention is that users can pick and mix different resources and tools to meet their specific requirements. We belief our visualisation tool, CompendiumLD, is distinct from other tools that are currently available in that it specifically focuses on helping the user to articulate their design process and make this process explicit, so that it provides an overall visualisation of the design which can be shared with others but also highlights potential flaws or gaps. We intend to include in-context help within CompendiumLD, including information derived from internal OU case studies, as well as selected resources and expertise drawn from our own experience in the field and the wider research literature. The tool is intentionally flexible in how it can be used; rather than impose a single 'correct' way of working:

- It operates at different levels, for example high-level learning outcomes, down to assets.

- It combines different types of activity, for example planning pedagogy, creating resources, specifying support, *etc*.

- It is an iterative process; an individual may switch between levels.

- Users will approach the design process from different perspectives; working from available resources, from assessment, or with specific technology in mind.

- It is both an individual and a group process.

Table One gives an outline of the key activities involved in the project. A major strand of activity is to try and better understand the design process, how teachers currently go about creating learning activities and what kinds of support and resources would help improve this process. This has included an extensive user needs analysis in terms of working towards a specification for a LD tool, Nixon

(2007) provides a summary of this and the main conclusions from this phase of the work. Further understanding is achieved through an ongoing series of focus groups and workshops – these include presentation and trialling of externally available resources and tools, as well as sessions that focus specifically on the tools we are developing. We have captured 44 institutional case studies of how technologies are being used across different disciplines (Wilson, 2007). A structured template was developed to structure the case studies. It was derived from earlier work on the development of a taxonomy which listed the key components involved in a learning activity (Conole, 2007). Sections covered included: the context within which the case study occurred, a description of the learning activity, and reflections including any identified barriers or enables. Case studies were captured via face-to-face interviews, which were transcribed and emergent themes identified. Each case study includes a visual representation of the design along with a textual narrative of the case study, including an outline of any barriers the designer encountered. We are also collating a list of external case studies, and learning design resources and tools. For each of these we are providing a summary of the key features and how it might be used to support the design process. We are currently conducting a series of in-depth interviews with teachers to provide empirical evidence of current practice and a better understanding of the design process. The interviews are focussed around five main themes:

1. How do teachers go about the process of design?

2. How do they generate ideas and what kinds of support do they use?

3. How do they share their designs with others?

4. What are the barriers to design?

5. How do they evaluate their designs?

The interviews are currently being analysed for emergent themes and compared with the data collected from the case studies. Similarly we are following a new course in educational technology in detail to identify how and when design occurs as the course is developed. We believe this more detailed evaluation will give us a very rich insight into the complexity of the design process, how it occurs as a course evolves and what are the different levels of granularity of design, which are considered at different stages in the process. Workshops and focus groups are designed to be highly participative, and include lots of opportunities for participants to feedback thoughts and ideas, these are captured and along with the data collected from the other sources discussed above, iteratively fed into the ongoing design process. Some events are also videoed for later analysis and/or have an independent observer make notes on the sessions.

Activities	Outputs and progress
Gathering user requirements	Initial understanding of user needs
Capturing existing learning activities through case studies	44 case studies written up and web site produced, categorised by type of activity, tools and discipline, barriers and enablers and key themes identified
Understanding and representing the design process	Range of representations identified, key benefits of each articulated, activity focused, process schema chosen as a primary visual metaphor
Development of a learning design tool	Adaptation of Compendium – CompendiumLD. This includes production of LD icon set and LD process templates, inclusion of adaptive, context sensitive help
Testing and evaluation through focus groups and workshops	Ongoing programme of workshops and focus groups presenting the current toolbox of resources and support. 8 faculty workshop and 1 external workshop run in phase 1.
Identification and collation of learning design resources	External repositories of learning objects and case studies collated, identification of and evaluation of the strength of external tools and resources for learning design.
Interviewing teachers about their approaches to design	15 interviews conducted, data being analysis and themes identified. Will provided empirical evidence of current practice and a better understanding of the design process
In-depth course team evaluation	A new course in educational technology which started being developed in Sept. 07 is being followed in detail as the course progresses to identify all the different stages and ways in which design occurs. Another in Science is currently being negotiated
Development of an LD toolbox	An online social networking site, CLouDworks, has been developed and is currently being seeded with resources.
Iterative reflection and adaptation in the light of feedback and evaluation	Feedback and evaluation is continually shaping the ongoing development activities of the project – from the technical development of CompendiumLD, identification of external resources and tools for inclusion in the overall toolbox, and creation of support materials and workshop formats.

Table 1 The main OU LD project activities

4   A new Learning Design tool - CompendiumLD

Our initial discussions about developing an in-house learning design tool included the development of a use case scenario of how such a tool might be used. Figure One provides an overview of what we see as being the key components of the tool and how it might be used. As illustrated on the left of the figure, a user could initially do one of three things; query an existing set of case studies or examples, begin with a pre-defined and structured design template (for example a step-by-step set of guidance for design) to take them through the design process or the user might choose to simply begin designing their activity, using the in-built contextual help as required. We envisaged the tool providing a number of elements which need to be considered in the creation of a learning activity, such as what tools, resources, or roles might be involved (as shown in the centre of the figure). Each of these would have a number of predefined aspects derived from our survey of OU practice and external projects. From their preferred starting point users could drag elements onto their workspace and start to build up their learning activity. The system will then prompt related elements, for example, if the user has selected a collaborative activity, then tools such as asynchronous conferencing, wikis *etc*, will be shown, along with additional advice and examples. The user would then build up an activity sequence, adding in conditionals and roles. The tool will prompt the user to add in required data, e.g. learning outcomes, estimated study time. In addition, if the activity is part of a course, then the system will import data from existing administrative systems, relating to level, subject area, etc. All designs will be saved to a repository thus increasing the range of designs for future users to draw upon. Ultimately the aim is for the system to build on user input, using web 2.0 principles, including user tagging (tag clouds) to demonstrate popularity, data mining established links between designs and tools, user comments, *etc*.
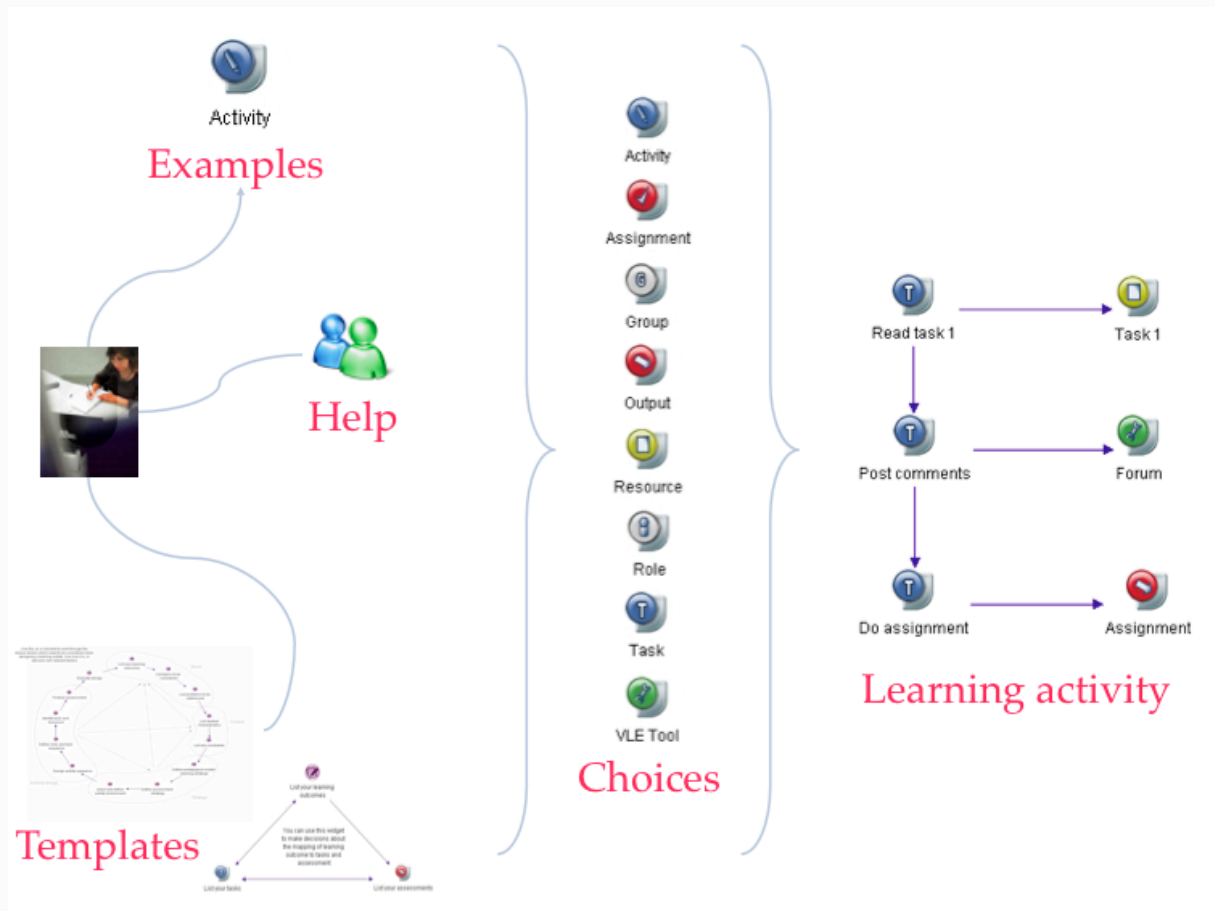
Figure 1 An overview of the Learning Design tool and its use

We are adopting an iterative process to the development of the prototype tool with the close involvement of the intended end users, so that we can learn from their use of the prototype and adapt it accordingly. Feedback from workshops is gathered during the event and via feedback forms. Reactions have generally been positive, users find the tool easy to use and feel that it helps them make the design process more explicit. Some however do not finding working visually helpful and others wanted more specific help and guidance. We felt such close user involvement will help us to identify how users interact with the different features of the tool as well as indicating what kinds of support and advice they find useful.

We selected the mind mapping and argumentation software, Compendium,[2] as our initial prototype for the learning design tool 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 and Buckingham Shum, 2008), 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 argumentation). The creation of a map is simple, users drag icons across and can start to build up relationships between these through connecting arrows. Each icon can have an associated name attached with more details contained inside the node, an asterisk appears next to the icon and 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 diagrams,

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[2] See http://www.compendiuminstitute.org/ for further details

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 pre-defined set of key words or through user generated terms. Maps can be exported in a variety of ways from simple diagrammatic jpeg files through to inter-linked websites.

CompendiumLD builds on the core functionality of Compendium but includes specific stencil sets and templates for design. In addition, in-context help around different LD icons is included and a series of illustrated examples which users can adapt. Figure two illustrates a learning design mapped out in Compendium, it represents a case study on the use of a wiki to undertake a collaborative requirements gathering exercise in computing. Two roles are shown (tutor and student), along with the respective tasks. Associated tools, resources and outputs associated with each task are shown alongside, with arrows indicating connections. Minocha *et al.* (2007) provide a description of the development of this particular learning activity and how it is being evaluated.
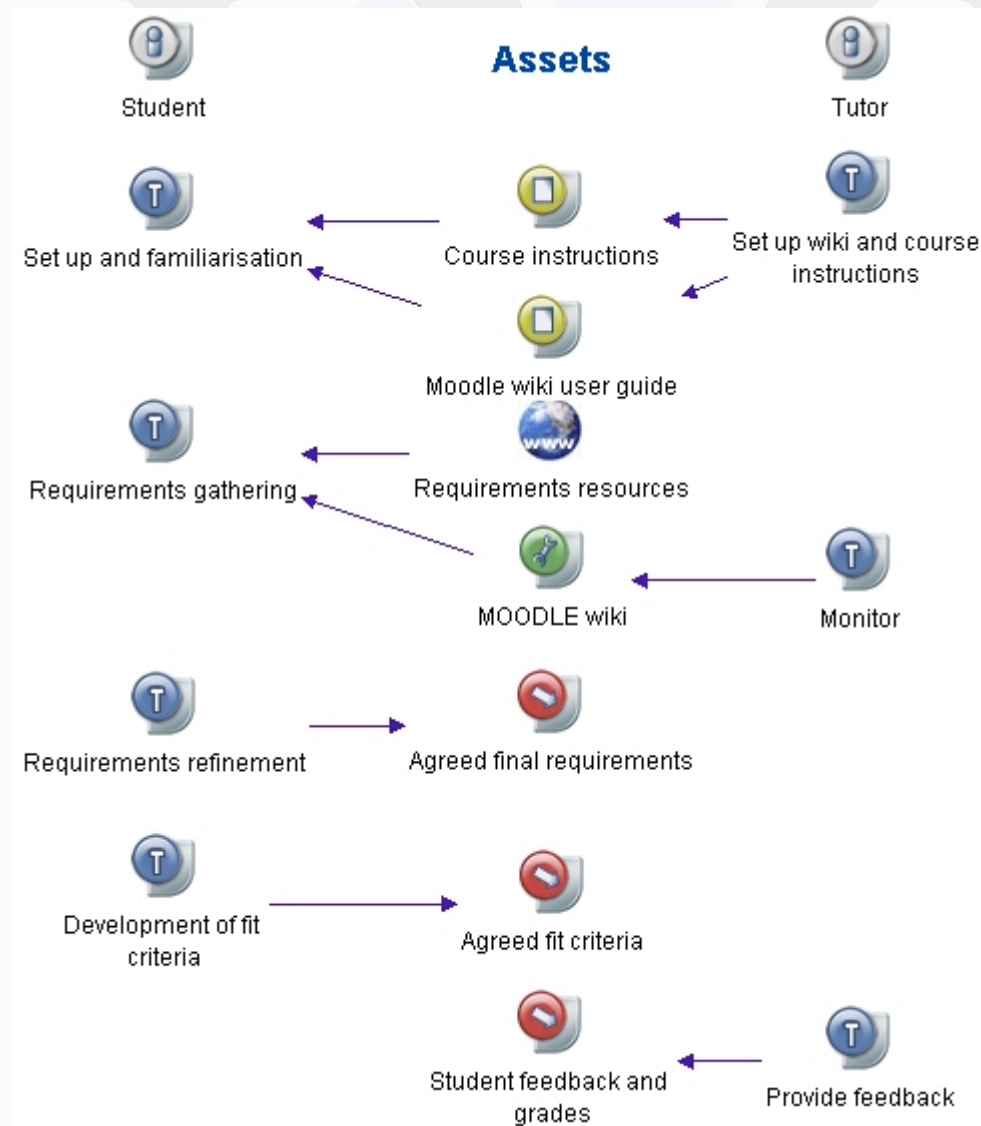

Figure 2 Visual representation of a collaborative activity using a wiki

We created a dedicated set of learning design icons, to complement the generic set available within the tool. As part of the core functionality of the tool it is possible for users to create and incorporate their own 'stencils' of icon sets. Once the appropriate set of icons have been identified, they are labelled with appropriate text and given an overarching stencil name set. We choose to focus on a simplified list of icons to represent what we felt were the key aspects of the design process, namely: task, role,

tool, resource, output, group, assignment, and activity. All of the icons are of the same type except for the activity icon which is a variant of the generic map icon. As with the core Compendium icon set users are able to rename each of the icons to something more appropriate to their context. Once created the stencil set is opened via the tool drop-down menu. Figure three provides a screenshot of CompendiumLD, showing the generic set of icons on the far left-hand side, along with the learning design stencil 'LD2' we created.
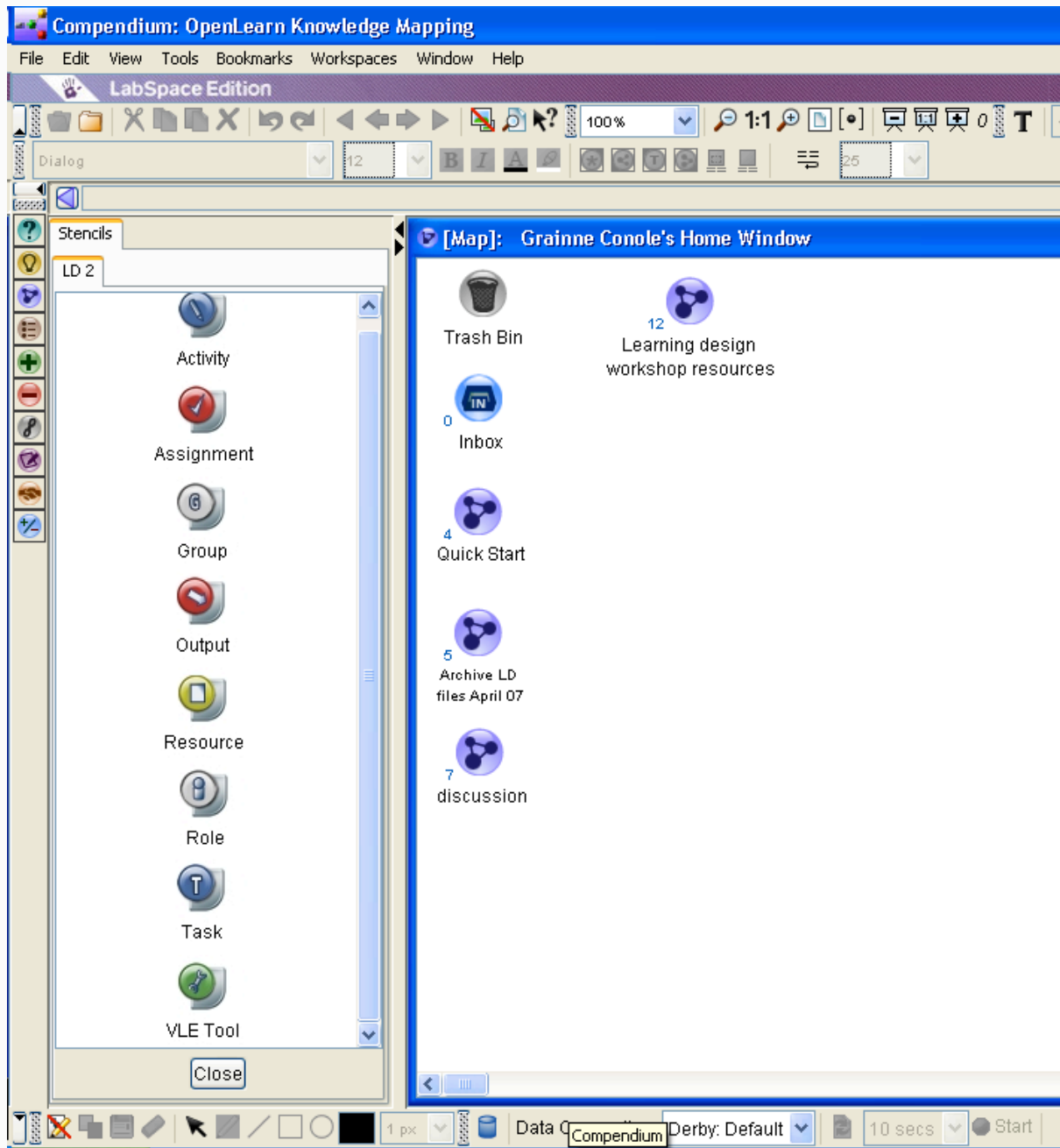

Figure 3 Screenshot of CompendiumLD with the LD2 learning design stencil set of icons

We used the new stencil set as a means of representing the learning activities being described in the case studies. As we began to represent this and based on feedback from users we realised that our initial iconic representation was overly complex and so we fixed on a simplified approach which consisted on a column for each role (student, tutor, *etc*) and an associated column for the 'assets' associated with that role (i.e. any resources, tools or outputs).

We also wanted to experiment with using different means of supporting the design process by creating a set of adaptable templates which users could work through and adapt to their own context. In addition to the creation of iconic stencil sets, CompendiumLD also enables the user to create customisable templates. A template is a CompendiumLD xml export file, which holds a set of maps/nodes which the user might use frequently. We used this template facility to create a series of learning design templates, focusing on a core set of different approaches to the design process:

1. Simple step-by-step guidance. Figure four provides a screen shot showing the LD template set on the side, along with the open 'Step-by-step' template.

2. Empty 'swim line' style diagrams showing the key components for creating a diagram.

3. Mapping templates: a simple one linking learning outcomes, tasks and assessment and one linking tools, discipline problems, outcomes, assessment learning activity and topics covered.

4. Two focusing on the 'affordances' (Conole and Dyke, 2004) that different tools and activities potentially offer.
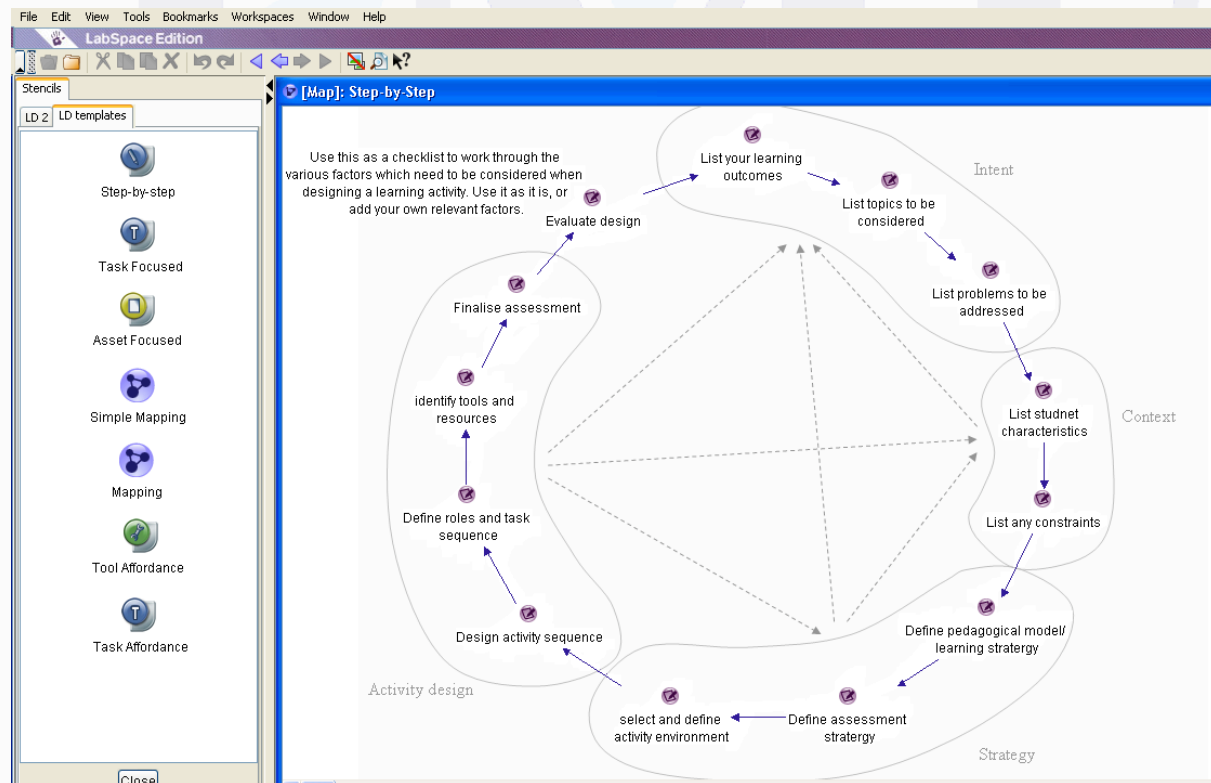

Figure 4 The seven LD templates with the step-by-step template open

During 2007 these resources were trialled through a series of workshops. The first consisted of a group of critical friends made up of e-learning researchers and educational developers. Feedback from the workshops has been very positive with attendees reporting that they liked CompendiumLD, found it easy to use and a useful tool to help them not only think about and articulate their design process, but also as a means of representing and sharing their design. However a number of issues remain; some users find it difficult to think visually, the prototype currently operates at a micro-granular level of activity and does not enable the user to switch to consider macro-design issues at the course level, and despite the relatively easy interface some users are likely to require more training and support than others. In addition it is unclear yet how such a tool might be used over a longer time frame within a collaborative course team to build up a shared and evolving design artefact. A workshop focusing on the use of the tool for developing OERs raised a similar set of issues. However in addition the process

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of using the tool as a means of deconstructing existing OERs also emerged as an additional means of using the tool in this context.

We are currently in the second phase of the project. We have considerably enhanced the functionality of the CompendiumLD tool. This includes the incorporation of context-sensitive help to the designer. 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, reflect etc.) pops up. Further help is linked via a customised Google search of selected web sites (http://www.google.com/coop/cse?cx=000971387191123125524%3Alworuyth0qs). The web sites were chosen because of the quantity and quality of the information they provide about use of tools in learning and include sites such as http://www.learningdesigns.uow.edu.au/ and http://www.educause.edu/. In the fact finding and user requirements part of phase two we are conducting a further series of interviews, as well working alongside a number of course teams as they develop the course, to begin to track the deign process over time. The focus is specifically on the design process rather than the nature of activities, which was the focus of the first round of institutional case studies. We wanted to gather views on how people currently design their courses, what approaches, strategies and help they use. In addition we wanted to gather views on what additional support they would find helpful - in terms of support material, workshops or interactive design tools. In addition to the CompendiumLD tool and the institutional case studies and empirical data from the interviews and course evaluations, the LD toolbox will contain a range of other tools and resources gathered from elsewhere. An outline of the tools and resources we are evaluating is discussed in more detail elsewhere (Conole, 2008b) but include a number of learning design tools currently being produced as part of the JISC design for learning programme (http://www.jisc.ac.uk/elp_designlearn.html) as well as international repositories of good practice. We are also interested in collating approaches to design and different ways of thinking about the design process. For example the 8LEM model (Leclercq, D. and Poumay, M., 2005) encourages the designer to think about the types of activity a learner might do; categorising these into 8 types (creates, explores, practices, imitates, received, debates, experiments, meta-learns). In contrast, Warburton (2007) provides a mapping of tools against three dimensions of use (passive-active, isolated-social and formal-informal).

5   The design of Open Educational Resources

The design of Open Educational Resources presents additional challenges to design in a traditional context. Cantoni (2008) provides an overview of the key problems, opportunities and challenges with OERs. He considers this in relation to the open source movement, learning objects, interoperability and recent developments in user generation of content and the web 2.0 movement; mapping this against Margulies' taxonomy of different forms of Open Education Resources (Table 2) (Margulies, 2005). It is encouraging to see that the OU Learning Design project maps across all three strands of Margulies' Taxonomy: CompendiumLD as an *OER tool*, the case studies, LD resources and external tools as *OER content* and the general philosophy inherent in terms of the project (gathering of empirical evidence about design, iterative development and evaluation of the LD toolbox, and flexibility and user focus) as an example *OER implementation*.

Tools	Content	Implementation
CMS (Educommons)	Open Educational resources (OU OpenLearn, MITOCW, Paristech, Japan OCW)	Licensing tools (creative commons, GNU free)
Development tools (Connexions)	Reference (Collections, Google scholar, library of congress, wikis)	Best practice (CMU – design principles)
Social software (wiki, H20)		Interoperability (IMS, SCORM, OKI)
LMS (Moodle, Sakai)	Learning objects (MERLOT, Connexions, ARIADNE)	OU LD project (OU cases studies, in-depth
LD visualisation tool (CompendiumLD)	Different ways of thinking about design	design interviews, in-depth course evaluation, collation of different ways of thinking
LD modelling tools (London Pedagogical Planner, Media Adviser)	(8LEM, mapping tools to pedagogy, Media Adviser)	about the design process)
Guided instruction tools (DialogPlus, Phoebe)	OU LD project (OU case studies, collation of external case studies and	
OU LD project (Identification and evaluation of LD tools, comparison of different approaches, user trials)	resources such as the GLOBE repository, and the AUTC LD site)	

Table 2 Adaptation of Margulies' taxonomy of OERs

Cantoni quotes Johnstone's (2005) definition of OERs, which includes the phrase 'community of users'. Similarly Downes (2006) believes that OER use could be improved most effectively through a shift from a 'provider/user' paradigm to a community model of collaborative development. For Cantoni the community of use and the context within which OERs are created and used is key; and we agree with his view that OERs in themselves are simply resources, which have potential that is only unlocked in use. He compares this to W. Von Humboldt's use of the terms 'ergen' and 'enérgeia'; where the former roughly equates to 'product' and the latter 'process'. In terms of OERs then the resources themselves are the 'ergen' but their real value lies in the process – how they are created by teachers and used by learners – this is the 'enérgeia'. This enérgeia is a vital aspect of any design process. Our evaluation of the CompendiumLD tool shows that users see the main value of the tool is that it helps make the process of design more explicit and that it provides a vehicle for developing a shared vocabulary and understanding of the design process. The resultant product (the 'ergen)' of the design, such as the CompendiumLD map illustrated in Figure 2, in isolation is of limited use, its value is in the associated 'enérgia' of shared creation and reuse.

We hope that the approach we have adopted with our work, in terms of creating a multi-faceted and flexible set of resources and support for the design process will help to foster the enérgeia of teachers in creating resources and learners in terms of using them. One of the key issues often cited about the OER movement is the issue of sustainability and different models have been proposed to support the ways in which the movement might continue past the current round of sponsored funding. One of the most promising is the concept of a self-sustaining community of designers and users. The approach we are adopting in the development of our evolving toolbox of support for design and in particular our plans to incorporate web 2.0 principles into this so that designs can be easily annotated and shared may be one means of helping to support a self-sustaining community of OER users.

6   Conclusion

The paper has discussed how adopting a formal learning design methodology might enable better creation and reuse of OERs. It has described the approach we are adopting at the Open University, including the rationale for our approach and the features of the prototype we have developed. Initial findings from an evaluation of its use are reported. An evolving set of briefing papers on different aspects of this work is available at http://e4innovation.com/?page_id=13 .

This is a challenging area rife with a range of issues both pedagogical and technical. Most importantly it is unclear yet *how* such an approach might be adopted and taken up by the community and to what extent it might help with the ultimate aim of facilitating easier and more frequent use of OERs. However despite this we believe adopting this learning design methodology is a useful approach for formalising and hence capturing existing practice and a mechanism for identifying associated barriers and enabled to uptake and reuse.

7   Acknowledgements

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