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Towards a user-oriented analytical approach to learning design

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The London Pedagogy Planner (LPP) is a prototype for a collaborative online planning and design tool that supports lecturers in developing, analysing and sharing learning designs. The tool is based on a developing model of the components involved in learning design and the critical relationships between them. As a decision tool it makes the pedagogical design explicit as an output from the process, capturing it for testing, redesign, reuse and adaptation by the originator, or by others. The aim is to test the extent to which we can engage lecturers in reflecting on learning design, and make them part of the educational community that discovers how best to use technology-enhanced learning. This paper describes the development of LPP, presents pedagogical benefits of visual representations of learning designs and proposes an analytical approach to learning design based on these visual representations. The analytical approach is illustrated based on an initial evaluation with a small group of lecturers from two partner institutions.

Keywords: learning design; pedagogy; technology enhanced learning; visual representation of pedagogy; cost of e-learning

Introduction

While it is acknowledged that lecturers should be responsible for new e-learning pedagogies, most have neither the time nor the design expertise to carry out the experimental innovation needed and would greatly welcome advice and guidance. This paper describes a project that has developed a prototype for a pedagogy planning tool that can scaffold the process of learning design innovation. It is designed for lecturers who are experienced in traditional modes of teaching and learning and may have experience of some learning technologies but who need support in making the optimal use of alternative teaching methods for their learners, especially those based on digital technologies. The tool is being designed to build a collaborative online community that enables lecturers to develop and share their learning designs.

Learning design is defined as: 'an application of a pedagogical model for a specific learning objective, target group and a specific context or knowledge' (Conole and Oliver 2006, 5).

A 'learning design' in the context of this project is seen as a multilayered plan, linking aims, learning outcomes, teaching methods, staff and student workload and a schedule of learning activities (see also Beetham 2004). The plan will operate on different levels of description of the learning process, for example:

- 'learning activity' – a collection of activities such as reading, discussing, experimenting, etc., intended to meet a specific learning outcome;
- 'session' – a set of learning activities intended for a short period of time;

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- 'module' – a set of sessions making up a unit within a programme leading to an award, e.g. a bachelor's degree.

The intention is that with sufficient support from a specially designed tool that meets their needs and aspirations lecturers will be enabled to lead the exploration and improvement of the new e-learning pedagogies.

The following sections review some of the current approaches to learning design and identify the issues and requirements for a learning design system that can support analytical thinking. We then describe the initial technical design and the user-oriented approach taken in developing the London Pedagogy Planner (LPP). Initial evaluation results are presented which show illustrative examples of visual representations used with lecturers' feedback based on interviews and workshops using the current prototype. The paper concludes with a specification for an analytical approach to learning design and the direction of future work.

Current approaches to learning designs

The purpose of a pedagogy planner is to offer a way of enabling teachers to exploit technology while creating pedagogically sound activities, as proposed in the LADIE Report on learning design (Conole et al. 2005). Teachers and lecturers are not typically learning design specialists, and while they may develop expertise in conventional teaching methods, it is much harder to do so for technology-based methods. Despite much localized innovation (Becta 2006; Beetham 2004; Joint Information Systems Committee [JISC] 2007), progress towards mainstreaming technology-enhanced learning (TEL) and optimizing its value is inevitably slow, as teachers lack time, supporting resources or training (Beetham 2004; Britain and Liber 2004). This is a problem that still needs to be addressed (Sharpe and Oliver 2007). The Mod4L project, within the JISC Design for Learning Programme, has reported a wide range of approaches to modelling practice (Falconer et al. 2007), including text, tables, charts, maps and diagrams.

The LPP project has reviewed several ways of representing learning design (see Table 1), each of which have a particular set of pedagogical benefits. However, many of them cover only a partial account of the learning design process. The different approaches presented in Table 1 show several attempts to elaborate the ways teachers think about learning designs. From an analysis of the full range of features offered in these separate approaches we argue that a more comprehensive learning design system could incorporate all of the following features:

- multilevel planning, i.e. course, module, session, activity and object;
- flexible editing and adaptability to users' needs;
- ease of use and simple manipulatable learning design components;
- a way of capturing the context of learning design that can be easily understood, interpreted, evaluated and shared;
- an instantiation of learning designs as a sequence of learning activities;
- support for teacher collaboration;
- alternative forms of external representations, giving lecturers the option to work with structured text or concept-mapping representations, etc.;
- a way of ensuring coherence between each of the components of learning designs such as topics, outcomes, methods, tools, staff resources and student workloads.

Table 1 also enables us to see that there are several important features of the learning design process that remain unsupported by any of these approaches. For example, there is no existing approach that offers default data for learning design components that covers workload of teachers and teachers' plan for students' time. Models of this kind can be helpful for teachers (Agostinho

Table 1. Current representations of learning designs.

Representations of learning design	Pedagogic benefits
A text-based course outline typically created using word processors or electronic spreadsheets (‘standard’ university templates)	Lists the basic components required by local institutions
A ‘tabular’ text-based planner which considers issues around the components of learning design (Beetham 2004)	Suggests integration of technology has to be carried out at different levels, i.e. programme, course, session and linking e-learning theories to practice, based on a case study approach Encourages reflection through questions given about issues of some of the components of learning design
Structured texts and tables to establish a set of standard ‘learning patterns’ (Goodyear 2005)	Establishes a standard vocabulary for distinguishing betweendifferent types of learning design, using a pattern frameworkwith standard features for the different methods, such as learningtasks (e.g. discuss, debate, investigate), organizational forms (e.g. dyad, T-group, project team) and learning environment (e.g. virtual library, chat room, textbook)
Team-based course design using conceptual mapping techniques (Inglis and Bradley 2005)	Specifies components of learning design and the relationship between them at course level Informs a sequence of topics and outcomes within a course – provides a ‘synoptic’ view of a course Makes relationship between components
A workflow diagram of a runnable of activities at the session level sequence (Dalziel 2003)	Creates a runnable representation of a sequence of learning activities, particularly for collaborative learner experiences Also offers a learner monitoring environment visualization that shows which activity learners are interacting with at a particular point in time
A concept mapping technique with text as annotation of sequences of learning objects with references to pedagogic patterns (Carle, Canny, and Clancy 2006)	Shows learner-centred courses along with the patterns that inspired the design Captures instructional expertise in a useful way for others Encourages experimentation with, and adoption of, best pedagogic practice Guides teachers in framing course goals and refining courses to meet them Offers a cohesive framework applicable across a range of instructional settings
A decision-making system based on ‘expert’ models that uses the notion of a learning activity that revolves around context, learning and teaching approaches and tasks (Conole and Fill 2005)	Provides a structured resource to plan, scope and cost an activity Helps to reduce the time and easy-to-use Provides guidance, which is not prescriptive Adapts for customization to the local context Provides a comprehensive resource of relevant material and database for activities
A web-based wiki type approach to reconciling contextual issues and to providing guidance to technology use (Masterman and Manton 2007)	Offers guidance, links to research summaries, examples for using e-learning teaching methods Community generated terminologies and guidance

2006) who use such external representations of learning design as: (i) aids for communicating and discussing pedagogical ideas; (ii) a way of capturing an implemented design; (iii) support for analysing and reflecting on a design; (iv) instant access to informative ways of understanding the pedagogic approach (Cameron 2007). For example, there are some lecturers who in their practice

translate the course design into a 'weekly schedule' based on their professional judgment (Inglis and Bradley 2005). It is important to explicitly show a model that can help teachers reflect on the timings they intend for learners and how, for example, their choice of teaching methods impacts on their workload and students cognitive activities (Laurillard 2006).

A second omission relates to the need to be able to contextualize a 'runnable' design by linking it with a corresponding 'inspirational' design, and there is no support given to lecturers that aims to help them in making this link (Falconer et al. 2007) nor one that operates at different levels, i.e. programme, course, session (Beetham 2004).

Based on these analyses, the LPP project claims to construct a more comprehensive tool to support leaning design.

Issues and requirements relevant to modelling learning design

The LPP project began by interviewing lecturers about their current approaches to course, module and session design. We then used storyboard and initial prototypes of the LPP tool as a way of both emulating their current practice and engaging them in a more reflective design process. This iterative user-oriented design approach (described in more detail in later sections) gave us the means to elicit a more detailed set of specifications for the LPP tool.

- *Pedagogic issues.* One of the basic principles of design in educational technology is that topic aims need to be linked to learning outcomes, to assessment methods and to the intervening teaching methods. Whilst many of the existing systems support listing of components of learning design, they are often defined separately in the documentation. It would be helpful, therefore, to offer a mapping option to make explicit links between these features once they have been defined.
- *Contextual and cultural issues*. Different institutions and departments use different terminologies for the features in a learning design. The unit of design may be referred to as a 'programme', 'course', 'module', 'session' or 'unit', and each of these can refer to widely different timescales of learning activity. The word 'lecture' can be interpreted quite differently according to local custom. Team teaching may be common in one institution, rare in another. A pedagogy planner must be adaptable and flexible, therefore, if it is to fit institutional requirements.
- *Representation and visualisation issues*. It is important to provide visualizations of the inputs to and outputs from the design process that prompt lecturers to reflect on their practice. Lecturers have different preferences for ways of representing the implications of their decisions and we need to experiment with a range of choices as the different stages, e.g. concept maps, lists, text, flowcharts, diagrams, schedules, charts, tables, pie-charts, etc.
- *Balance of control over data.* Lecturers need to input their own data if they are to engage fully in the process of designing learning. However, they must also find it very quick and easy to make sense of the process and complete a draft design. To this end, the tool offers default data at every opportunity (e.g. pre-selected teaching methods, default number of staff hours to prepare a 1 hour lecture or an online discussion, default proportion of learner time spent on different cognitive activities for each teaching method). All the default data offered must, of course, be easily editable by the user to fit their own context.
- *Flexible database design.* The data on definitions of components and their parameterized values are held in a database. The database design reflects the links between the components and enables users to begin at any stage in the design process. Each decision overwrites default data or earlier decisions and each stage calls on the most recent entry for that data item – if a teaching method is added at the 'scheduling' stage, for example, it will appear

in the list of teaching methods in the 'module outline' stage, with default data on staff preparation time ready for use or for editing. This flexibility is essential, because lecturers continually iterate between the different levels of granularity of their learning design and have different preferences for where to begin.

- *Ownership*. The pedagogy planning tool is for lecturers' own use and it should be their decision whether any part of their learning design is made available to peer teachers and managers. It is designed to also be used as an online collaborative model with a team of lecturers working together on a master copy and progressive versions. There is a concern, however, that the tool intended for lecturers' personal use may be taken over by managers as an administrative tool. It could be used in this way, with appropriate safeguards, but begins as a tool that uses authentication and permissions that are personal to the user.

This set of issues contribute to the requirements for developing a pedagogy planner tool. Thus the main functions of a pedagogy planner are to support the following.

Planning

Ensuring that all the components of learning design (such as educational aims, learners' needs, learning activities and intended outcomes) are addressed and are compatible with each other, at different levels of description, which may be defined as course, module, session or learning activity.

Decision-making

Helping lecturers make decisions by feeding back the implications of one decision on another part of the process, using an inspectable and editable model of the internal relations between components, and representing their resulting design in a clear way.

Progressive innovation

Linking each decision to relevant online advice on learning design (such as the community-generated advice being developed in the complementary JISC-funded Phoebe project[1] in the UK) online learning object repositories (e.g. JORUM,[2] OpenLearn[3] and RLO-CETL[4]), case studies (e.g. CDE,[5] TLRP,[6] Becta,[7] JISC,[8] NIACE[9] and HEA[10]), learning designs (from the D4L programme[11]), distillations of educational research findings (e.g. TLRP briefings, JISC briefings, Becta reports, HEA summaries and searches on journals) and any local information about learner needs (e.g. feedback surveys and examiners' reports).

Analysis

Inspecting and editing the explicit model of internal relations (e.g. the allocation of staff time for preparation and presentation of each teaching method used; the proportion of different cognitive activities that a selected teaching method facilitates) and comparing the effects of different learning designs (e.g. how the use of different teaching methods affects staff workload and cognitive activity).

Collaboration

Building a community of practice, where lecturers can discuss and share learning designs, learn from each other and build on each others' ideas.

Administration

Allocating lecturers' time, learners' time, estimating comparative costs, publishing schedules for modules or sessions and producing module level planning for administrative purposes.

A user-oriented approach to developing requirements

To be able to build a pedagogy planning tool that lecturers would actually use it was essential to involve them in the design and development process throughout the project. A small group of lecturers from the two partner institutions were funded to take part as informant-practitioners (Conole et al. 2004; Laurillard and McAndrew 2003; Oliver et al. 2002). The design of the first prototype began with a set of interviews with five informant-practitioner lecturers from partner institutions. The participants were chosen based on their experience in using learning technologies within their teaching. The interviews covered their practice in designing learning with and without technology. From these interviews it was clear that lecturers plan learning in different ways, starting from different levels of description of the learning process, although most used only word processing tools and a text-based plan. The interview confirmed the issues identified above and also generated some other requirements related to interface manipulation and interface representations (and usability, which will not be covered in this paper).

The development of the tool focused around the design issues identified from different data sources. The analysis of data from initial interviews and existing literature provided the initial prototype design for the basic functionality needed for a planning tool. This was implemented first as an Excel spreadsheet, to test the selection of learning design components, the validity of the relationships between them and the idea of a systematic approach to modelling learning design. The next prototype was developed from this using the Director multimedia authoring software, to test the form of the visual representations to be used in the interface. Having validated the basic functionality and interface representations, we then re-implemented these specifications to build the full prototype in Java.

An Agile method of development was adopted that includes iterative phases of design, development and evaluation (Boyle et al. 2006). The technical team responsible for development of the tool met regularly to discuss design issues emerging from trials with lecturers and to decide design priorities to address them. Several versions were released to the project team through a 'Google group' site for discussion and suggestions for changes. The site served as a way of documenting the features for each release, the discussion of results and the record of successive versions. For each phase of development trials were carried out with the lecturers linked to the project, first as a storyboard using PowerPoint, with notes pages for each slide to gather comments and answers to specific questions. Once the design has stabilized the next version of the prototype is developed and tested in one-to-one or workshop sessions, gathering as much data as possible about the users' reactions and further requirements.

The design and development of the pedagogy planning tool proceeded from that point as a continually iterative process of 'interview – storyboard – feedback comments – prototype – observation of trial use – revision – new prototype'. At each stage the feedback affecting design of the tool was recorded and reported in interim project reports. In this way we have successively refined the description of user requirements and the prototype versions of the pedagogy planner tool.

The proposed approach to learning design

As part of the JISC 'Design for Learning' (D4L) programme the Mod4L project has examined a range of practice models to determine how best to describe a formalized approach to

learning design. The framework for the 'generic form of a learning design' includes attributes such as 'the forms of learning outcomes sought and achieved, e.g. forms of knowledge acquisition, skills, understandings', 'the role of technology, e.g. need for specialised software, custom tools, communication requirements, processing needs, etc.' (Falconer et al. 2007). The proposal for the LPP was to cover the majority of these attributes, but to specifically exclude attributes such as access to technology or course information to prospective learners in order to focus on the design of learning itself. The rationale for the project was that lecturers need practical assistance in understanding how best to design activities for their learners, given the intended outcomes, the nature of the student body and the learning environment (Beetham 2004).

It was important that the learning design process should produce a working product, as this made the time spent worthwhile. To be able to do this the pedagogy planner tool had to make use of a model of the components of learning design and their interrelationships and link its output to a runnable learning design environment. LAMS (Learning Activity Management System[12]) was chosen as the most highly developed environment of this kind currently available. The planner tool was conceived as a series of decision stages relating to the standard components of learning design as defined by the lecturers' module design templates already in use in their institutions. The model underlying the tool was conceived as a simple mapping between components, standard definitions of the principal parameters for each teaching method or learning activity and default values for the principal resource parameters of staff time and student time needed. The model is inspectable, as a table of values or as a map of links, and is editable at each stage of the decision process.

The pedagogy planner tool is designed to offer a support tool for the kind of blended learning design that lecturers need to carry out, from the initial curriculum requirements, learner needs and resource constraints to e-learning activities in use by their students. The design is also aimed to allow well-developed existing tools and theoretical frameworks to be embedded or integrated with the tool (e.g. LAMS). It is designed to produce runnable learning designs that embrace new technology.

The underlying principle of the pedagogy planner tool is to use current good practice to create and check the relationships between the different aspects of the user's input (e.g. balancing learners' resource and teaching time; linking topics, outcomes, methods, and assessments; supporting decisions on sequencing and scope of topics; testing designs based on pedagogical frameworks; providing exemplars and links to existing web-based resources). It is intended to address the issues identified in the previous section, such as providing enough flexibility to adapt to the needs of educational lecturers in different departmental and institutional contexts while enabling the sharing of expertise across contexts.

Modelling the detail of the learning design in terms of the time required of both staff and students involves a series of decisions, all of which are optional because they have default data pre-assigned:

- select teaching methods (TMs);
- define maximum group sizes for relevant TMs;
- estimate staff preparation and presentation time needed by TM;
- define proportion of development that will reuse existing materials;
- distribute learner's time over TMs;
- define ratio of cognitive activities by TM;
- inspect resultant staff workload;
- divide staff workload between senior and support staff;
- inspect plan for resource deployment across module.

The structure of the model is a simple, logical relationship between the parameters (e.g. if the module has 50 students and the group size for a tutorial is defined as 10, then the module will have 5 tutorial groups). The default parameters are exactly that – 'tutorial' group sizes range from 2 to 30, for example, so these parameters will often be edited for the local context. Making the results of design choices inspectable in this way has proved to be an illuminating process for lecturers, who begin to discover why they feel overworked. They have also discovered their unrealistic expectations of the time specified to be spent by their students.

The illustrative models with lecturers' feedback

The different tools and systems reviewed in the previous section have not shown many examples on how the tools support teachers' analytical approach about their decisions in the learning design process. For each type of decision in the planning process it is important to test its feasibility in terms of appropriateness for lecturers and for interpretability (see also Laurillard, Boyle, et al. 2007; Laurillard, San Diego, et al., 2007). There is no space to discuss here the full list of models implemented in the LPP, but we can illustrate some of the models of the LPP with some of the evaluation results gathered through workshops, observations and feedback comments. First, we give an example of workshop data collected to show the feasibility of an analytical approach to learning design, then we illustrate how the analytical approach worked with the lecturers in terms of representations of allocation of time to teaching methods and resultant cognitive activities, mapping of different components of learning design, how scheduling of topics are mapped to outcomes, selection of learning design based on learners' needs and the default taxonomy of learning design and annotations of the activity sequence.

Several one-to-one observations were carried out with the lecturers associated with the project, but in order to evaluate the tool with larger numbers we also used workshops of up to 20 lecturers at a time. The aim was to find out whether the tool prompts lecturers to analyse a learning design using visual representations of their decisions in the process of design. In the workshop setting each user worked on their own design, answering questions on a worksheet as they progressed. The worksheet items correspond to the functionalities being tested. For example, in Figure 1 item 2 records the lecturer's feedback on the feature that distributes time to teaching methods.

The interim evaluation with lecturers to date suggests that lecturers appreciate the value of a systematic approach to modelling their learning design, making their decisions explicit and editable.

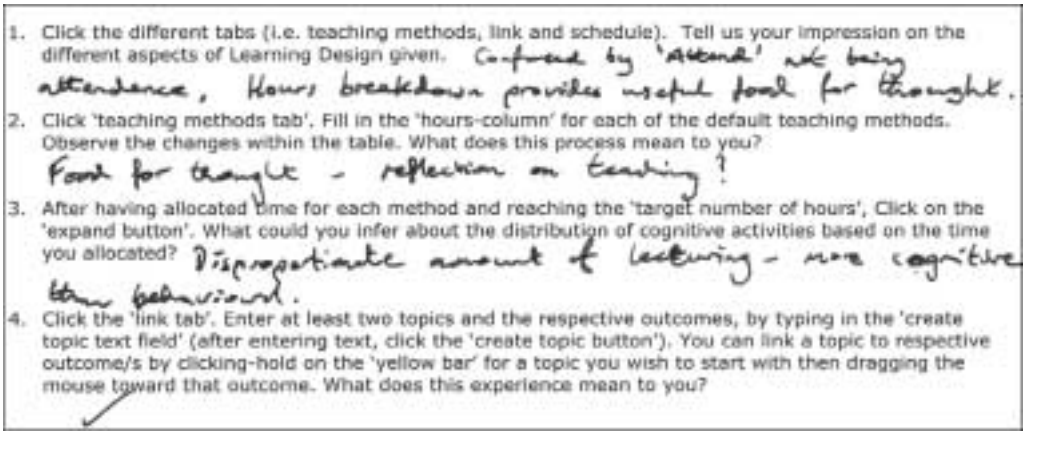
1. Click the different tabs (i.e. teaching methods, link and schedule). Tell us your impression on the different aspects of Learning Design given. Confused by 'Attend' not being attendance, Hours breakdown provides useful food for thought.
2. Click 'teaching methods tab'. Fill in the 'hours-column' for each of the default teaching methods. Observe the changes within the table. What does this process mean to you? Food for thought - reflection on teaching?
3. After having allocated time for each method and reaching the 'target number of hours', Click on the 'expand button'. What could you infer about the distribution of cognitive activities based on the time you allocated? Disproportionate amount of lecturing - more cognitive than behavioural.
4. Click the 'link tab'. Enter at least two topics and the respective outcomes, by typing in the 'create topic text field' (after entering text, click the 'create topic button'). You can link a topic to respective outcome/s by clicking-hold on the 'yellow bar' for a topic you wish to start with then dragging the mouse toward that outcome. What does this experience mean to you?

Figure 1. Worksheet data from a workshop participant.

In the workshops conducted so far 42 out of 51 (82%) of the participants agreed that the pedagogy planner is a worthwhile development, while 3 out of 51 did not agree, 2 out of 51 were unsure and 4 out of 51 gave no response. 28 out of 51 participants were willing to be contacted for follow-up on their feedback, while 13 out of 51 were willing to be contacted for future user testing.

The following are extracts from the lecturers notes that show the kinds of analytical thinking for each of the examples of the representations of their learning design process.

Planning at the module level

Figure 2a shows how the teacher has distributed the total credit hours (100) among the teaching methods they have elected to use (lectures, tutorials, Tutor Marked Assignments and online asynchronous conferencing). Each teaching method has default data on the proportion of cognitive activities it elicits in learners, e.g. 'lecture' elicits mainly 'attention'. While engaging on this part of the planner one evaluator commented on its value as a way for teachers to pass on their learning designs: 'Would also think about it as a hand-over tool from one module convenor to another'.

Figure 2b illustrates how the teacher has shifted some of the time allotted to tutorials and lectures to online asynchronous conferencing. A pop-up box offers a link to a research summary that provides the basis for the default data for tutorials and online conferences. The planner automatically calculates the learner experience, given the hours for each teaching method. The planner automatically puts in the learner experience data and calculates the new distribution across the total hours. One lecturer during a hands-on workshop commented: 'I am not asking them (students) to do things on their own … I have changed those (timings) … It does make you think, doesn't it?'

A different kind of representation is the mapping between components, e.g. to ensure appropriate linking between topics and outcomes. After having entered topics and learning outcomes, by 'drawing' a line using the mouse the teacher can ensure mapping between components (e.g. topics listed on the left side of Figure 3 to selected outcomes on the right). It becomes very obvious if there is a learning outcome that is not covered, which forces consideration of whether it should be, and if so how. Teachers often want larger text boxes to describe topics and outcomes, so these can be entered and recalled as rollover text. One tutor commented: 'The mapping principle is sound, and multiple mappings are important – really nice and visual'.

The schedule interface in Figure 4 shows topics listed in the top part, automatically inherited from Figure 3. Beside the list is a 'calendar-like' visualization, below which is a visualization for the outcomes previously linked to those topics. The tool then offers the functionality to schedule which topics are to be covered in which weeks: clicking on a 'cell' for a topic also highlights the corresponding 'cells' for the linked outcomes for each week. With this visualization lecturers may reflect on the number of learning outcomes they are asking learners to tackle within a week. If they seem unbalanced they can easily edit the schedule by clicking and dragging boxes representing topics. Commenting on this functionality one tutor reported: 'I like this very much, because it's mapped in my topics for me and it's showing me them in weeks and it's showing where they can overlap'.

Planning at the session level

Having identified the learners' needs, the teacher can now select, from several possible learning designs, the one they wish to pursue in order to investigate existing examples on which they might build (Figure 5). As one tutor commented: 'It encourages thinking outside the current teaching box and therefore [the use of] other methods'.

The session plan for learners' activities can be implemented as an activity sequence in LAMS, which then runs online, managing the student group through their individual and collaborative

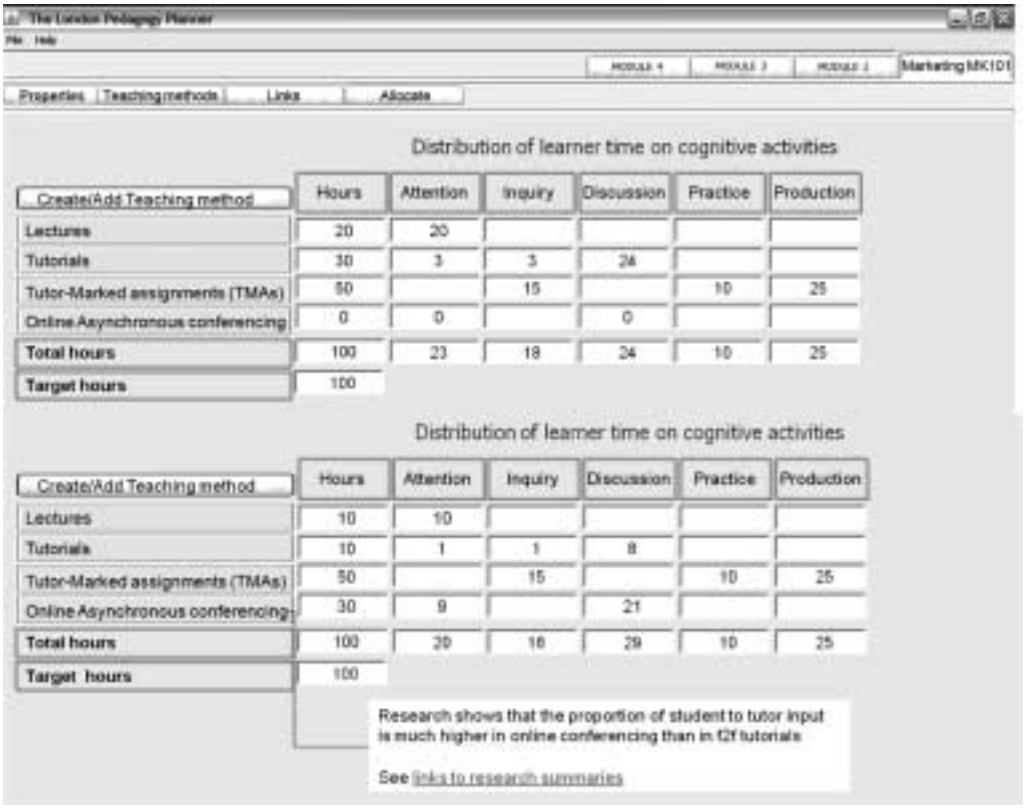

Figure 2. Allocating time to teaching methods and resultant cognitive activities. This figure also shows 'a pop-up text' as a user-specified functionality on how a link to online advice can be presented in the interface. Lecturers can then opt to 'expand' the allocation of hours in terms of the different cognitive activities they elicit. Lecturers have access to default online definitions of the cognitive activities given. For example 'attention' as the learning activity elicited when learners are passive, in comparison with 'discussion', meaning that for this learning activity learners spend some time listening but a much greater proportion in active preparation for or participation in or reflection on discussion.

activities or directing them to conventional offline activities (Figure 6). Teachers can annotate the sequence representation in the LPP, which can give guidance on different types of tool for a particular activity from the community-owned resource bank, which evaluators of the 'Phoebe' prototype planner tool have found particularly useful: 'The types of content – not come across anything that does that type of thing before, things that people do need to think about but don't always do'.

Concluding points and future research: groundwork towards a user-oriented analytical approach to learning design

The LPP is based on a model of the critical relationships between the components of learning design and aims to make the use and development of this model accessible to lecturers. The underlying model is itself a representation of current theoretical frameworks for learning design. We have seen that the interface design for the component features, while still needing further

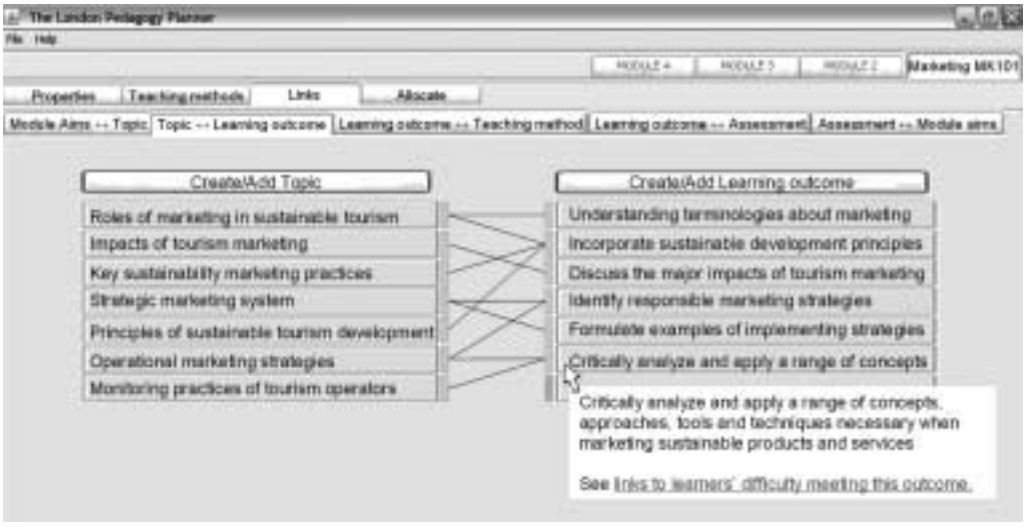

Figure 3. Ensuring appropriate linking between topics (left) and outcomes (right).

development, clearly answers their design needs. In general the feedback from lecturers suggests that:

- the tool provides the kinds of support lecturers need to assist them in learning design for new technologies;
- the visual representations of learning design decisions and their consequences are welcomed, and workable;

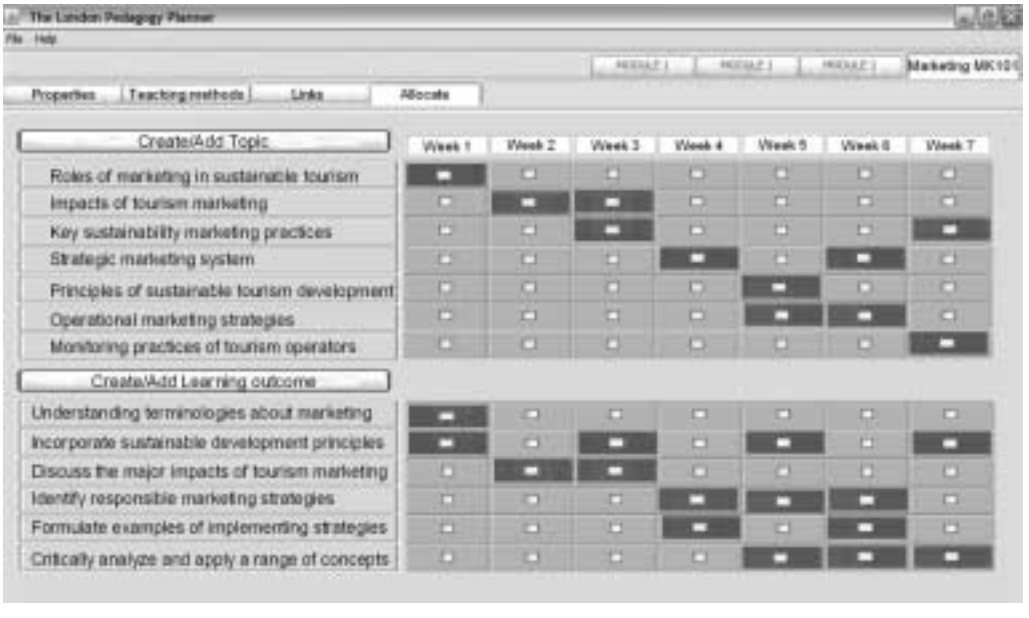

Figure 4. Scheduling of topics, with the previously linked outcomes also shown.

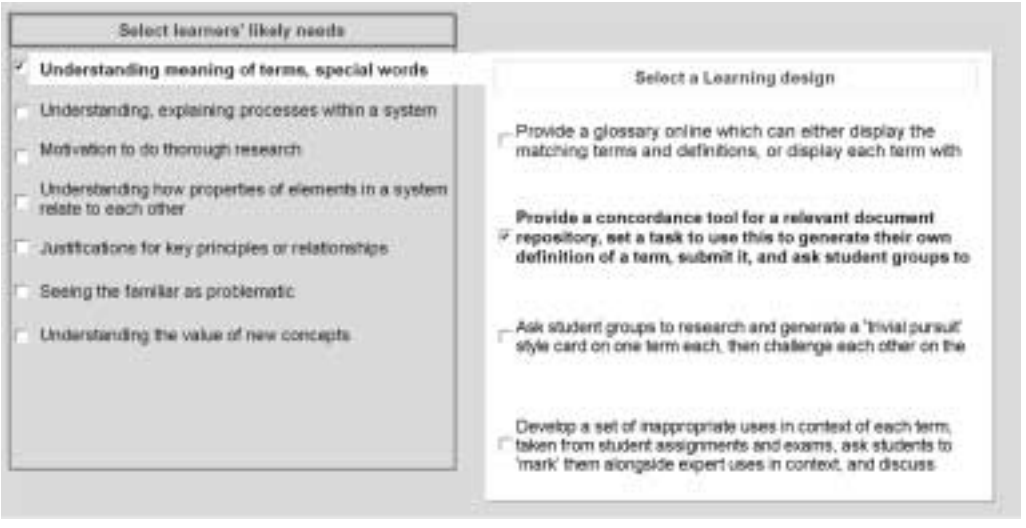

Figure 5. Learning design selection relevant to learners' needs.

- the design process was quite straightforward, but even at this level prompts lecturers to reconsider their responses and to see links within their module they had not previously noticed;
- the approach of offering default input for design decisions that users can edit or accept is an efficient way of enabling lecturers to work quickly to understand how to use the tool and to use it at the level of analytical detail they prefer;
- lecturers want integration with VLEs and the means to manage the development and sharing of a large number of learning designs.

There are many issues still to be resolved, for example how to represent alternative learning theories, how to establish a unified understanding of the terminologies related to learning design, how

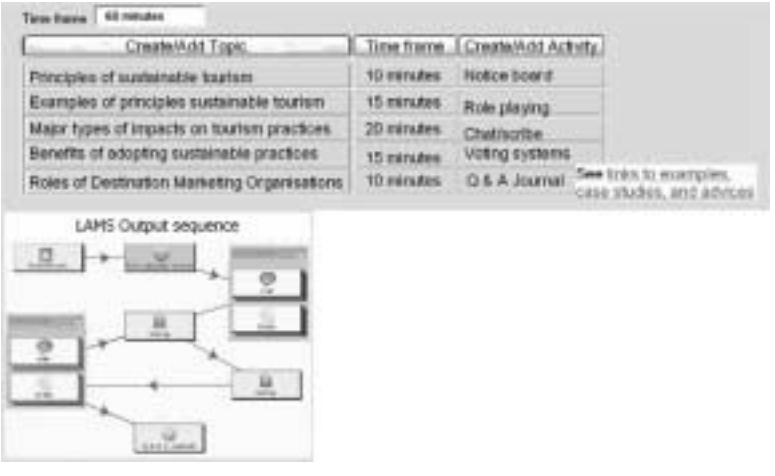

Figure 6. Annotation of the learning activity sequence in LAMS.

to offer a choice of representation, how to track ownership of shared designs, etc. Nonetheless, this style of pedagogy planner provides an effective way to explore these issues.

This research will help inform design-based research. We hope that this tool will aid teachers to be researchers in their own classroom as we are exploring ways in which teachers can generate research data from use of the tool that tests their practice in the form of their design. This is possible by extending the functionality of the tool so that teachers can feedback what has transpired during their teaching back into the LPP and can analyse their inspirational design in comparison with what has transpired.

At present we have not yet isolated the best way to link to external learning activity systems such as LAMS and have not yet fully clarified the requirements to make the tool collaborative. This is the subject of further research. The work to date has shown that the lecturers are enthusiastic about the idea of an interactive and collaborative planning tool for learning design. We have also been able to clarify some of the essential requirements for such a tool. Our findings are:

- a pedagogy planner must have enough flexibility to support lecturer planning and design processes at different levels of granularity – module and session levels certainly, but extending it also to activities within sessions and to aggregating modules into courses and even degree programmes;
- within each level of granularity lecturers want to be able to link to advice on fundamental aspects of learning design;
- a system that offers default 'data' input seems to be effective in guiding lecturers' use of the tool and the decision-making involved;
- lecturers appreciate having visual representations to help them think through the learning design decisions they make at each level;
- by making explicit the results of their decisions, using visual forms of representation, lecturers are able to reflect on what they bring to the classroom;
- lecturers can be designers and act as researchers of the learning experience they are facilitating for their learners;
- it is feasible to model lecturers' approaches to learning design with sufficient flexibility that it can support a range of such approaches.

We aim to address the challenge of providing a design environment in which lecturers can benefit from representations of explicit learning design decisions, build on others' work, make use of learning theories and existing resources, test them in practice and thereby support innovative learning designs. In this way we hope to give lecturers the time and the means to become more closely involved in the design of e-learning pedagogies. We are examining how the use of this approach can alter existing practices of teaching and learning.

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Notes

1. Phoebe, A Wiki to support design for learning. http://phoebe-project.conted.ox.ac.uk/cgi-bin/trac.cgi.
2. http://www.jorum.ac.uk/.
3. http://openlearn.open.ac.uk/.
4. Reusable Learning Objects – Centre for Excellence in Teaching and Learning. http://www.rlo-cetl.ac.uk/.

5. Centre for Distance Education. http://www.cde.london.ac.uk/.
6. Teaching and Learning Research Programme. http://www.tlrp.org/.
7. http://www.becta.org.uk/.
8. Joint Information Systems Committee. http://www.jisc.ac.uk/.
9. National Institute of Adult Continuing Education. http://www.niace.org.uk/.
10. Higher Education Academy. http://www.heacademy.ac.uk/.
11. Design for Learning. http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_ design learn.aspx.
12. Learning Activity Management System. http://www.lamsinternational.com.

References

Agostinho, S. 2006. The use of a visual learning design representation to document and communicate teaching ideas. Paper presented at the 23rd annual ascilite conference: Who's learning? Whose technology?, December 3–6, in Sydney, Australia.

Becta. 2006. *The Becta review 2006: Evidence on the progress of ICT in education.* Coventry, UK: British Educational Communications and Technology Agency.

Beetham, H. 2004. *Effective practice with e-learning.* Bristol, UK: Joint Information Systems Committee.

Boyle, T., R. Windle, D. Leeder, H. Wharrad, R. Alton, and J. Cook. 2006. An Agile method for developing learning objects. Paper presented at the 23rd annual ascilite conference: Who's learning? Whose technology?, December 3–6, in Sydney, Australia.

Britain, S., and O. Liber. 2004. *A framework for the pedagogical evaluation of elearning environments.* Bristol, UK: Joint Information Systems Committee.

Cameron, L. 2007. Scaffolding effective learning design with pre-service teachers. Paper presented at EdMedia, World Conference on Educational Multimedia, Hypermedia and Telecommunications 2007, June 25–29, in Vancouver, Canada.

Carle, A., J. Canny, and M. Clancy. 2006. PACT: A pattern-annotated course tool. Paper presented at EdMedia, World Conference on Educational Multimedia, Hypermedia and Telecommunications 2006, June 26–30, in Orlando, FL.

Conole, G., and K. Fill. 2005. A learning design toolkit to create pedagogically effective learning activities. *Journal of Interactive Media in Education* 8: 1–16.

Conole, G., and M. Oliver. 2006. *Contemporary perspectives in e-learning research.* London: Routledge.

Conole, G., M. Dyke, M. Oliver, and J. Seale. 2004. Mapping pedagogy and tools for effective learning design. *Computers and Education* 43, nos. 1/2: 17–33.

Conole, G., A. Littlejohn, I. Falconer, and A. Jeffery. 2005. *Pedagogical review of learning activities and use cases. LADIE Project Report.* JISC E-learning Programme: JISC.

Dalziel, J. 2003. Implementing learning design: the learning Activity Management System (LAMS). Paper presented at Interact Integrate Impact: the 20th annual conference of the Australasian Society for Computers in Learning in Tertiary Education (ascilite), 7–10 December, in Adelaide, Australia.

Falconer, I., H. Beetham, R. Oliver, L. Lockyer, and A. Littlejohn. 2007. Mod4L final report: Representing learning designs. Glasgow Caledonian Academy. http://www.academy.gcal.ac.uk/mod4l/.

Goodyear, P. 2005. Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology* 21, no. 1: 82–101.

Inglis, A., and A. Bradley. 2005. Using conceptual mapping as a tool in the process of engineering education program design. *Journal of Learning Design* 1, no. 1: 45–55.

Joint Information Systems Committee (JISC). 2007. In their own words: Exploring the learners' perspective on e-learning. JISC. http://www.jisc.ac.uk/intheirownwords

Laurillard, D. 2006. Modelling benefits-oriented costs for technology enhanced learning. *Higher Education* 54: 21–39.

Laurillard, D., and P. McAndrew. 2003. Reusable educational software: A basis for generic learning activities. In *Reusing online resources: A sustainable approach to e-learning,* ed. A. Littlejohn. London: Kogan Page.

Laurillard, D., T. Boyle, C. Bradley, T. Neumann, and D. Pearce. 2007. *A user-oriented planner for learning analysis and design: Second interim report.* London Knowledge Lab, Institute of Education.

Laurillard, D., J.P. San Diego, T. Boyle, C. Bradley, D. Ljubojevic, T. Neumann. 2007. *A user-oriented planner for learning analysis and design, Phase 2: Interim report.* London Knowledge Lab, Institute of Education.

Masterman, L., and M. Manton. 2007. Phoebe phase 1 evaluation report. Phoebe. http://phoebe-project.conted.ox.ac.uk/cgi-bin/trac.cgi/wiki/Phase1EvaluationReport.

Oliver, R., B. Harper, J. Hedberg, S. Wills, and S. Agostinho. 2002. Formalising the description of learning designs. *Quality conversations: Research and Development in Higher Education* 25: 496–504.

Sharpe, R., and M. Oliver. 2007. Designing courses for e-learning. In *Rethinking pedagogy for a digital age: Designing and delivering e-learning,* ed. H. Beetham and R. Sharpe, 41–51. London: Routledge.