A theoretical approach to distillation of pedagogical patterns from practice to enable transfer and reuse of good teaching

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The promise of the learning design pattern approach to resolve the problem of adequate support to practitioners has not materialised. Our contention is that this is due in part to the lack of a pedagogically grounded model. We have made use of the Conversational Framework (Laurillard, 2002) to guide us in an analytical scoping of the problem space and to ensure a strong focus on the pedagogical properties of a learning design. Our assumption is that successful support for the learning design process can only be based on a model that gives prominence to the critical pedagogical properties of a Learning Design.

To this end, the work we are engaged with aims at understanding the critical factors in what makes good Teaching and Learning Activity design, and how they can be fore-grounded in a formal representation.

Our approach is introduced by positioning it in relation to similar work so far, most notably the work on learning design patterns. The paper begins with a critique of the current approach to the design pattern paradigm in the field of learning technology. Building on this earlier work, our methodological approach is explained and a prototype pedagogical pattern representation based on the Conversational Framework is presented, to illustrate how this might work in practice.

Keywords: Pedagogical Pattern, Pattern Representation, Learning Design, Teaching-Learning Activities

Introduction

The work presented in this paper represents a key strand of the EPSRC/ESRC funded three-year interdisciplinary project titled A Learning Design Support Environment (LDSE www.ldse.org.uk), with the primary concern of providing support to teachers. The rationale is straightforward: supporting teachers in designing for learning increases the potential of achieving the desired improvements in the learning experience of students. The support in this sense is addressing the issue at the heart of educational practice - 'how to identify and provide what it takes to learn' (Laurillard 2008). Supporting teachers in doing this is necessarily subject to understanding what it takes to learn and providing teachers with access to that understanding in the form of tools. One of the principal strategies adopted by the LDSE is to enable teachers to build on the work of others by providing the support tools to assist them in finding, interpreting, evaluating, and, reusing/redesigning the work of their colleagues. Operationalising that strategy requires a way of representing the theory and practice of learning design so that the analytical links, between the pedagogical first principles and the practice-instance, are exposed and offered to practitioners as support.

To this end, the LDSE project work we are engaged with aims to understand the critical factors in what makes good Teaching and Learning Activity design, and how they can be fore-grounded in a formal representation.

Our approach is to work from existing accounts of good teaching and learning activity design documented in the learning patterns literature, but to analyse and extend these descriptions with reference to what learning theory suggests is needed.

The LDSE project ethos is to focus on the 'Teaching and Learning Activity' (TLA), not simply the 'Learning Activity' in an attempt to emphasise the teacher's responsibility for the learning process in the context of formal education. The focus on the technology as liberating the learner from the control of the teacher, with a student-oriented education becoming possible through the opportunities in the digital world, risks overlooking the critical role the teacher must play in supporting learning through technology. We set out to capture and represent the interplay between the responsibilities of both teacher and learner in this new dynamic.

Background

The need to address teacher's needs in the face of significant change in HE in the UK has been well documented (HEFCE 2005, 2006), see (Laurillard and Masterman 2009) for a recent and comprehensive review of the problems, factors, and potential solutions to the problem. Our work is concerned with supporting that change, in the manner of 'if you build it they will come[1]'. Certainly, the provisions that we are designing, on the level of the LDSE project as a whole, need to be informed by the genuine practitioners' needs if they are to adopt them in their practice. The work we are pursuing within the strand of the LDSE project described in this paper, is a contribution to that overall aim, and is concerned with designing the representation tools that are of high pedagogical relevance to teaching practitioners. With this in mind the review of the literature in this section is aimed at examining the research and tools concerned with operationalising pedagogical design support to teachers.

Historically, the dominant trend of providing support to teachers as learning designers has been the technological one. The IMS LD specification (2003) has been developed as the basis for tools to offer practitioners the means to increase the use of technology in their existing practice, by making it computer interpretable. Initially, logistical gains brought about by the use of VLEs encouraged technological scaffolding of the existing practice and produced a number of offshoots, such as IMS LD-inspired LAMS[2] and IMS LD-based Graphical Learning Modeler (Neumann and Oberhuemer 2009).

As it has been noted: '*IMS LD allows it to model a business process such as a mortgage application just as well as it can model a tutorial'* (Sitthisak and Gilbert 2009), the pedagogically agnostic model behind IMS LD does not itself offer the opportunity for teachers to think about the pedagogy behind learning design. But to expect this from a specification that was never intended to support pedagogical decision making in the first place would be wrong. IMS LD models the consequential aspects of learning design, once the pedagogy is decided, it does not set out to support thinking about the pedagogical design itself.

The driving force behind any learning design should be the pedagogy, the how and why of learning, and thereafter the mechanisms and resources for realising that pedagogy should be considered. The intent behind the IMS LD specification was to enable the technologists to build applications that would provide learning design support, including pedagogical support, to end-users – teachers; in this way the teachers can only indirectly engage with IMS LD. This notion of IMS LD as the learning design interoperability solution has been echoed recently by Dalziel:

> By finding a shared language for describing educational activity structures, we lay the foundations for the most important promise of Learning Design – sharing of good teaching and learning ideas among educators. (Dalziel 2009).

[1] Often misquoted original quote - 'if you build it he will come ' – from the book Shoeless Joe (W. P. Kinsella, 1982). Reference is to building a baseball pitch on a farm to offer a redeeming chance to a fallen baseball hero. Allusion here is that the change cannot be forced it can be attracted.

[2] http://lamsfoundation.org/

Dalziel's (Ibid) analogising of the development of Learning Design notation with the development of music notation,

> … a few hundred years before the Baroque period, music notation was quite different from today, and some key elements were missing or underdeveloped (especially notation of rhythm – that is, time). The result of this difference is that a typical musician today would be quite uncertain how to reproduce the musical experience denoted by the earlier system of music notation.

highlights the dominance of interoperability concerns in the research and development work in learning technology. The focus on a notation for interoperability obscures an important and crucial consideration: to use a music analogy, the would-be-composer's understanding of music notation is a necessary but not a sufficient pre-condition for composing (designing) good quality music, music composed to a brief. We have to get beyond the shared language, or notation, to what counts as good quality in the content being represented. This consideration features in Dalziel's thinking:

> There are many topics ahead of us for research on Learning Design, including: theoretical/ontological questions about the most useful framework we could adopt… (Ibid)

The 'notation first' approach can be summarised as follows: allow the practice to be expressed and exchanged, and it will evolve naturally. For all its simplicity, that has not happened. Even in developing a notation, the question – is the notation easily adoptable by the practitioners? – needs answering. Our contention is that it is not, partly because it lacks a pedagogically informed foundation. To make it more adoption friendly we need to provide more meaningful benefit to practitioners, in terms of their practice. To understand not only 'how' but 'why' a pedagogical design works is a precondition to having teachers innovate, and to being able to offer some substantive, informative, and overall immediately relevant guidance to the practitioners.

In reviewing the literature on learning design support tools, our primary focus has been on the way these tools, and the models that underpin them, define and enable thinking about the pedagogical properties of learning design. By pedagogical properties we mean those properties of a particular learning design instance that are critical to promoting its intended learning outcomes. The following section looks at the derivation principles of pedagogical detail for the purpose of informing the design of the pedagogical support to learning designers.

Informing the informants – where should the pedagogical design support be coming from
Generally, the approaches to arriving at 'good learning design rules' (Koper and Tattersall 2005), to support learning design process, can be categorised by their source, from either theory, practice, or patterns of learning design. Each of the sources has its benefits and drawbacks. For example, '*the theoretical approach is intended to be of general purpose because it excludes conditions as much as possible, the example-based approach is so highly contingent on conditions that the chance of finding a matching example is relatively small'* (Koper and Tattersall 2005). Furthermore, approaches can be examined in the way they discriminate between a variety of contributing design elements of a learning design, such as: epistemological (coming to know detail), curricular (how to prepare/decompose the material), and, what can be termed as 'logistical' (student-grouping strategies).

The term 'theory' in learning design literature is commonly indiscriminately used to cover two quite distinct categories of analytical engagement (Reigeluth 1999): a Theory of Learning as a set of empirically validated explanations of learning as a natural process, and Instructional Design Theory (IDT) as a set of prescriptions of probabilistic instructional methods that are likely to effect a specific type of learning in specific conditions. This distinction is a very important one, and has been described elsewhere as the distinction between 'natural sciences' and 'the sciences of artificial' (Simon 1969).

> 'Therefore, descriptive theories are also useful to practitioners, because they provide an understanding of why a design theory works and because they can help practitioners to generate their own design theories for those many situations for which no adequate ones exist.' (Reigeluth 1999)

There is a sense that an attempt to operationalise theory for its easier application (the aim behind IDT) produced a significant gap between 'the pedagogical why' and 'the instructional how' of learning design. Our work aims to bridge this gap. To enable teachers to innovate there necessarily has to be a way for them to go back to the first principles of derivation of a given learning design they are thinking of using (Laurillard and Ljubojevic in print); moreover these principles need to be expressed in practitioner's terms, with strong links to the learning design instance in practice.

The more recent, widespread adoption of the approach to the derivation of 'good learning design rules' that are the basis of any learning design support mechanism, is the design patterns approach. The design patterns approach has its origins in architecture and it is based on an assumption:

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

It is easy to see the appeal, and understand the widespread adoption of the design patterns approach. It is neither theory nor practice driven; it simply entails the search for, and documenting of the recurrence of design problems and related design solutions in the environment. Koper and Tattersall (2005) differentiate two ways of going about such an approach, inductive and deductive, which do in effect exhibit respectively a practice and theory emphasis. Inductive is about analysing the regularities in a common set of learning design methods, and deductive is drawing upon experiences of the learning designers to identify recurrent problems and the generic models for solutions.

Several patterns collection projects (ICOPER, TELL, Learning Designs, PLANET)[3] have followed the inductive/deductive routes: collect instances of teaching practice, evaluate/theoretically analyse and re-describe the patterns using the patterns collection-specific template.

The question is, given the purpose, what aspects of learning design methods and/or educational problems should this pattern-derivation process focus on, and what should be ignored? The danger is that once everything that constitutes the formal educational context is seen as being in focus for this exercise, the approach quickly runs aground. To avoid this there is the requirement for delineating the critical from non-critical pedagogical properties of a learning design that promotes a specific learning outcome. This delineation guidance on 'how to identify and provide what it takes to learn' (Laurillard 2008) should in effect act as an analytical scoping framework that would not only inform the endeavour but serve as the basis for developing the theoretical/ontological framework for pedagogical patterns, of the kind that (Dalziel 2009) writes about (see above quote). The next section outlines a way of systematising the thinking about the pedagogical design patterns.

The Conversational Framework

The design pattern approach has not so far found a systematic, and theoretically informed means for describing the pedagogy inside the learning designs. This leads to unsystematic, text-based, and anecdotal representations of the pedagogy that characterises a learning design instance, which is hard to interpret and is prone to misinterpretation (Laurillard and Ljubojevic in print).

3 ICOPER http://www.icoper.org/

Learning Designs http://www.learningdesigns.uow.edu.au/

TELL http://www.elearningeuropa.info/directory/index.php?page=doc&doc_id=4729&doclng=6

PLANET http://patternlanguagenetwork.myxwiki.org/xwiki/bin/view/Main/

To help systematise the pedagogical descriptions, and to provide the analytical scoping guidance to practitioners, we have tried using the theoretically informed Conversational Framework (CF), which set out to be a theoretically comprehensive framework for capturing what it takes to learn (Laurillard 2002). The CF consists of the most minimal set of activities by teachers and learners that captures the complete teaching-learning process. Different orderings of these processes can be linked to different pedagogies (Laurillard 2009), so that when ordered inside a particular teaching-learning episode they exhibit a form that we define as a pedagogical pattern. Thus conceptualised, a pedagogical pattern is systematically described in a way that can be interpreted in terms of learning theory, opening up the potential for an objective, theoretically informed interpretation of its potential against the learning outcome it is designed to promote.

The CF specifies 14 types of cognitive activity by teacher and learner that together define the pedagogy of the teaching-learning process. These activities have a clear pedagogically purposeful role, such as: share ideas with peers, share practice with peers, act to achieve goal, reflect on practice feedback etc. Using this set of activities as an interpretative vocabulary of pedagogical 'moves' we analysed a set of learning designs from disparate collections and subject disciplines. The way the CF was used to inform our approach to, and the representations of, pedagogical patterns is presented in the following sections.

Theorising LD Practice - Methodology

The LDSE approach to understanding what is and what is not a pedagogical pattern and how to represent it, coupled with the aspiration to build on the work of others, resulted in a methodological approach presented in Figure 1.

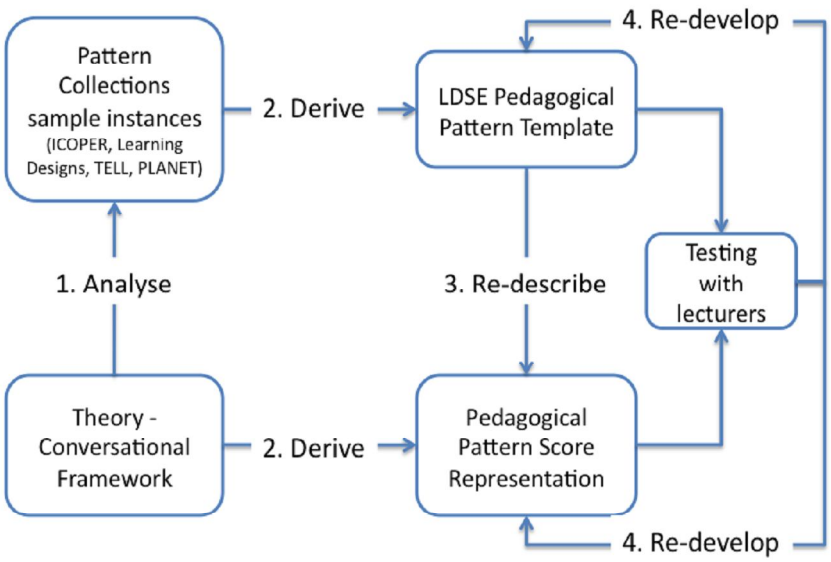

Figure 1: Approach Cycle

We started with theoretically informed Conversational Framework and used its strong focus on the pedagogy-critical design information to (1) analyse sample learning design patterns from several pattern collections. This analysis yielded a reduced set of learning design pattern descriptors that were (2) used to derive a common description template (LDSE Pedagogical Pattern Template). The template was then used to (3) re-describe the same set of pedagogical pattern instances in a generic form using a pedagogical patterns visualisation device – the Score. Both representations were tested with experienced practitioners to (4) redevelop the representations until they properly captured what was seen as critical to the pedagogic patterns concerned.

Pattern Collections Data Sampling Rationale

The choice of data for analysis was guided by ensuring a balanced variety of the sources, subject disciplines, time duration, and, level of study (postgraduate and undergraduate). This varied data set helps to ensure that our approach is tested on all fronts and in all ways, and consequently has the potential to further validate our findings. Two patterns in the data set were chosen from our team members' teaching practice (unpublished), which are well described, well used, and have been evaluated as successful. One pattern comes from the empirical study on transfer to prediction (Schwartz and Bransford 1998). Finally, two patterns come from the Learning Pattern Collection projects (ICOPER and Learning Designs)[4] as these represent the work of our colleagues and are the natural choice in terms of assessing the compatibility of our approach with the work of others.

Common Description Template

Table 1 shows a comparison between excerpts from three patterns collection templates devised to enable practitioners to describe their practice in a systematic way. The shaded cells in Table 1 present the pedagogically critical descriptors. The remainder of the descriptors do affect the design but are not critical. What is the most striking feature of this approach is that the crucial design detail, in *Sequence of Activities* (ICOPER) and *Solution* (in Planet and TELL), is provided for in the form of text-based accounts of the activities that address, respectively, the *Learning Outcomes* (ICOPER), and the *Problem* (Planet and TELL). This type of provision offers little generalisable guidance for teachers about how to link the pedagogical aims with the pedagogical means. Moreover, it offers only unsystematic and unstructured text-based accounts that would be hard to interpret computationally in order to inform computer-based design support.

Table 1: Pedagogical Pattern in LD Collections

ICOPER	***Planet***	***TELL***
Author & Copyright		Credits
Summary/ Thumbnail		Context
Rationale	*Rationale*	*Rationale*
Subject/ Discipline	Context	
Learning outcomes	*Problem*	*Problem*
		Forces
Group size		
Duration (part)		
Learner Characteristics		Audience
Sequence of Activities	*Solution*	Diagram
		Solution
Roles		
Type of Assessment		

In order to promote more pedagogy-focused description of learning design we define the pedagogical pattern (PP) as a structured set of core properties of a learning design (LD) that are critical to facilitating the student in achieving the intended learning outcome. The template we used for our analysis (Table 2) reflects this strict focus on the core pedagogical properties.

4 ICOPER http://www.icoper.org/

Learning Designs http://www.learningdesigns.uow.edu.au/

Table 2: the LDSE Pedagogical Pattern Template

Title	Usually the working title for the pattern
Summary	Structured summary of the following form: To what End by What Means ; this will potentially be used by the search engine to make inferences about the functional orientation and character of the pattern.
Rationale	Pedagogical rationale providing learning theory justification that links learning outcome with the pedagogical method
Learning outcomes:	Higher Cognitive Skill learning outcome(s), most commonly of the following form: To Be Able To Perform/Apply/Resolve etc.
Sequence of Activities:	Ordered and timed sequence of Teaching and Learning Activities, each interpreted for the type of Conversational Framework activity it represents
Type of Assessment:	How can we prove that the learning outcome is achieved
Time	Duration of the TLAs sequence that executes this pattern

These categories omit the contextual and logistical aspects of a learning design, important though they are, because a generic pattern of the kind we are aiming for will need to be adapted to its local context. However, they include more detail on the way the learner's and teacher's time is spent on the activities. The representation of the pedagogically critical properties of learning design is discussed in the next section.

Pedagogical Pattern Representation

In order to foreground the progression of the pedagogy over time in the learning design representation, without compromising clarity, we decided to use the representation metaphor of a *score*. In part this choice was inspired by the analogy between the maturation of LD notation and that of history of development of musical notation, put forward by Dalziel (Dalziel 2009). The metaphor of a *musical score*, embodied in our representation of a *learning score*, that unravels over time seemed appropriate as it offers designers the clarity (by virtue of familiarity) on which the overlay of pedagogically structured 'moves' can be imposed. We made sure that the representation format's structure was not too rigid, so that practitioners can still use their own language and labels to denote the activities and processes, but these are slotted inside the formalised structural whole. Figure 2 presents the representation of a fragment of one pedagogical pattern we investigated. The current form of the representation is not necessarily the one that will survive for users of the LDSE. With the informant practitioners we are investigating both the nature of the representation (a score that categorises activities over time) and the content (the category names and the types of content included).

Each *segment* contains, starting from the top:

1. A set of recommended design patterns (these could inform the grouping, curricular and/or epistemological decisions) suitable for the Teaching-Learning Activity (TLA) contained in the segment,
2. The formal, abbreviated functional purpose behind a segment,
3. The number of the segment in the sequence, using a Roman numeral,
4. A set of interlinked Teacher-Learner Activities, each positioned against a single related CF pedagogical activity type, with an abbreviated, informally described label
5. The duration of the segment in time,
6. The user's original description of the activities, and the purpose behind them, inside the segment.

The flow of the TLAs is from left to right and is further specified with the use of arrows. The arrows denote intra and inter segment cohesion between the activities. The arrows are especially important when there is a need to represent a cycle of activities that the learning process needs to run through for ensuring that learning takes place. The *segments* representation reinforces visually the idea of the parts of a pattern being resolved by lower level patterns. The TLA composites normally occurring in a *segment* have so far proven to be the lowermost unit of analysis for pedagogical consideration. Below the level of TLA composites (contained in a *segment*) the inquiry into 'what makes it work' is possible but it belongs to the discipline of Cognitive

Psychology. It can be linked with the pattern representation and offered as support to designers in a read-through manner, but it cannot be represented using the representation format in Figure 2.

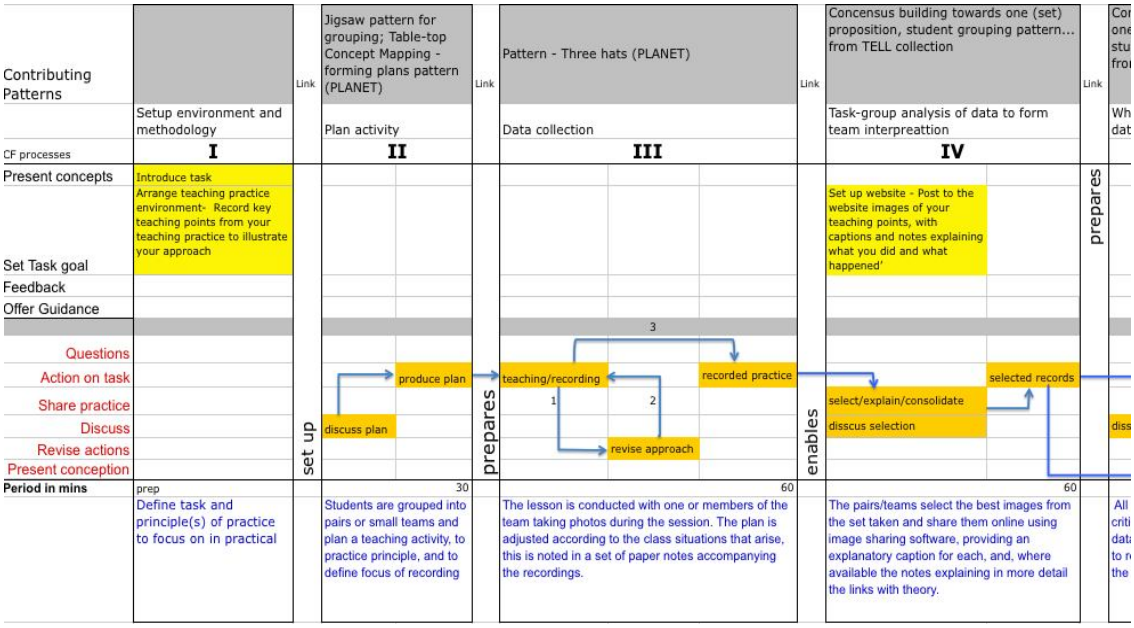

Figure 2: Pedagogical Pattern Representation – the Score

The representation allows for mapping the practitioner's intent onto the (CF pedagogy metric) structure and that in turn enables a theoretically informed interpretation of the pedagogical design to be made, and therefore also, potentially, a theoretically informed evaluation of its quality. It is important to emphasise that the representation in Figure 2 is an early form of representation enabling the computational system to access the design details. More work needs to be done on the way it will be presented in the user interface. It is also important to emphasise that at this stage of the work the mapping of a pre-existing pattern narrative has to be done 'by hand'. If we can demonstrate that we have a mapping of sufficient generality to be able to express all the learning design patterns we attempt to map, then it becomes possible to collect an increasing set of standard pedagogical patterns, whose general pedagogical properties can be instantiated in all the particular activities we collect.

Findings

The findings are presently informative about the methodological approach and cannot be yet offered as guidelines for practical use. The early tests with selected practitioners show great potential behind the approach.

We are presently testing in the prototype an approach that makes use of five types of learning, representable in the Conversational Framework as learning through: *acquisition, inquiry, production, discussion,* and, *practice*. The approach sees each Teaching-Learning Activity (TLA) as defined by its *epistemic character*, and, its *epistemic orientation*. The former asks the question 'in what way?' and the latter 'to what end?' of the TLA structure. Then the TLA can be presented as a point in the coordinate system defined by its *epistemic character* (CF activities) and its *epistemic orientation* (learning outcome).

We plan to test empirically the representation presented with a representative sample of the target group of teaching practitioners. The testing would first elicit users' responses to the *learning score* representation, and then prompt them to use the same format to represent three textually described example patterns. Finally, it

will be tested by asking the user to represent their own pedagogical pattern using the *learning score* representation.

Discussion

If this methodology is successful in finding a robust representation of learning design patterns, then it will be possible to use it for the discovery, categorisation, representation, and evaluation of learning designs, as intended. This will form part of the knowledge and intelligence built into the LDSE. The LDSE system as a whole would thus be 'equipped' to address the pedagogical-design support aspect of the practitioners needs within a wider learning design support context.

In addition, the process will generate a pattern language, by finding the terminology that defines the most generic form of a learning design pattern description that preserves the richness of its pedagogy. These terms will form the main terms (concepts) used in the LDSE. However, since they will be derived from an ever increasing collection of existing patterns, there is the potential to develop a thesaurus of terms that are cognate with the LDSE generic terms (concepts).

The next stage of this methodology will be to test (i) the learning design pattern representations described in this paper, (ii) the intelligibility of the LDSE concepts and their definitions, and (iii) the comprehensiveness of the collection of terms as synonyms for the LDSE concepts.

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References

Alexander, C., Ishikawa, S., & Silverstain, M. (1977). *A pattern language: towns, buildings, construction.*: Oxford University Press, US. 0195019199, 9780195019193

Dalziel, J. (2009). Prospects for Learning Design research and LAMS. Teaching English with Technology, *Special edition on LAMS and Learning Design*, 9(2).

HEFCE. (2005). HEFCE Strategy for e-learning: Higher Education Funding Council for England.

HEFCE. (2006). Strategic Plan 2006-11 Higher Education Funding Council for England.

Koper, R., & Tattersall, C. (2005). *Learning Design: a handbook on modelling and delivering networked education.*: Springer - Verlag Berlin Heidelberg.

Laurillard, D. (2002). *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* (2nd ed.). London: RoutledgeFalmer.

Laurillard, D. (2008). *The teacher as action researcher: Using technology to capture pedagogic form. Studies in Higher Education*, 33(2), 139-154.

Laurillard, D. (2009). The pedagogical challenges to collaborative technologies. *International Journal of Computer-Supported Collaborative Learning*, 4(1), 5-20.

Laurillard, D., & Ljubojevic, D. (in print). Evaluating learning designs through the formal representation of pedagogical patterns. In J. W. a. C. Kohls (Ed.), *Investigations of E-Learning Patterns:* Context Factors, Problems and Solutions: IGI Global.

Laurillard, D., & Masterman, E. (2009). TPD as online collaborative learning for innovation in teaching. In O. Lindberg & A. D. Olofsson (Eds.), *Online Learning Communities and Teaching Professional Development: Methods for Improved Educational Delivery*. Berlin: Springer.

Neumann, S., & Oberhuemer, P. (2009). User Evaluation of a Graphical Modelling Tool for IMS Learning Design. In *Advances in Web Based Learning – ICWL 2009* (Vol. 5686/2009): Springer Berlin / Heidelberg.

Reigeluth, C. M. (Ed.). (1999). Instructional-Design Theories and Models Vol 2: *A New Paradigm of Instructional Theory*. Mahwah, NJ.: Lawrence Erlbaum Associates.

Schwartz, D. L., & Bransford, J. D. (1998). A Time For Telling. Cognition and Instruction, 16(4), 475-522.

Simon, H. A. (1969). *The Sciences of the Artificial*, 2nd Edition. Cambridge, Mass.: The MIT Press.

Sitthisak, O., & Gilbert, L. (2009). Improving the pedagogical expressiveness of IMS LD. Paper presented at the *International conference on Technology Enhanced Learning Conference.*

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