Abstract
This paper critiques learning design as a representation for sharing and developing practice, based on synthesis of three projects. Starting with the findings of the Mod4L Models of Practice project, it argues that the technical origins of learning design, and the consequent focus on structure and sequence, limit its usefulness for sharing practice between teachers. It compares practice models with two alternative, more flexible, representations, patterns and bundles, based on the outcomes of the Pattern Language Network project (Planet) and of the Centre of Excellence in Teaching and Learning Active Learning in Computing (CETL ALiC). It concludes that while practice models may be useful in mediating between teachers and technical developers, they cannot encompass the range of practice teachers require to represent. A pattern language is more comprehensive and has the advantage of being generative, but is difficult for teachers to acquire, and bundles may provide a more adoptable representation.

Keywords
learning design; practice models; patterns; bundles; representations; teaching practice

Introduction
Learning design has two different roots within the field of technology-enhanced learning. The first of these is in the attempt to build computer systems that would orchestrate the delivery of learning resources and activities for computer-assisted learning. It is exemplified by
developments such as the IMS Learning Design specification (IMS 2003), the attempt to build a learning activity reference model (Falconer 2007, Falconer et al 2006), a Shareable Content Object Reference Model (ADL, 2004) and the Learning Activity Management System (LAMS) engine (Dalziel, 2003). The second is in the need to find effective ways of sharing good and innovative practice in technology-enhanced learning. It responds to recognition that, despite excitement and belief in their potential by developers, teachers have been slow to adopt such methods; in this formulation learning design is an aid to efficiency and professional development for teachers, and examples include Australian Universities Teaching Committee (AUTC) learning designs (Bennett, Agostinho, & Lockyer, 2005), DialogPlus (Conole & Fill, 2005), LAMS sequences (Dalziel, 2003), and pedagogic patterns (Goodyear & Yang, 2008).

These roots came together in the concept of “design for learning” as defined by the UK Joint Information Systems Committee (JISC) in its “Design for Learning” programme that ran through 2006-2007 (JISC, 2006a): a desire to describe the orchestration of learning activities in a way that might be managed and delivered by computer; and a desire to find representations that would enable the sharing of innovative technology-enhanced teaching practice as an aid to professional development for teachers. Thus the programme defined a learning design as the outcome of the process of, “designing, planning and orchestrating learning activities as part of a learning session or programme” (JISC, 2006b p.1), while explaining that the purpose of the programme was, “to develop further the community’s understanding of the principles that inform the design of effective learning activities which involve the use of technology” (JISC, 2006a p.1). In this paper we adopt the JISC definition of learning design (JISC, 2006b p.1)

A learning design may exist purely in the head of the teacher implementing it, especially in higher education. However, as Vogel and Oliver (2006 p.4) point out, “in order to be comprehended by others, designs must also be represented or articulated.” However effective a design may be, it can only be shared with others through a representation. Efficient sharing and reuse can take place only if the representations are effective; they must convey the information that teachers need in a form that teachers can understand. The issue of representation, then, is central to the whole drive to share and reuse designs.

This paper presents a critique of learning design, based on synthesis of the outcomes of three projects from the viewpoint of the second aim, that is, to find effective ways of sharing good and innovative practice in technology-enhanced learning. The projects were:

- Mod4L: Models of Practice project funded by the JISC under its Design for Learning programme
- Pattern Language Network (Planet) project funded by the JISC under its Users and Innovation programme (http://www.jisc.ac.uk/whatwedo/programmes/usersandinovation.aspx)
- CETL ALiC (Centre for Excellence in Teaching and Learning: Active Learning in Computing) funded by the Higher Education Funding Council of England (http://www.dur.ac.uk/alic)

The relationship between these projects, and two others mentioned in the paper, is summarised in Figure 1.

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4 In this paper we follow emergent convention in distinguishing between “learning designs” (lower case “l” and “d”) as defined above, and Learning Designs which are a specific representation of learning design conforming to the IMS LD specification.
Based on the experience of the Mod4L project with practice models, we argue that there is a need to capture, represent, and share intrinsic aspects of teaching, if teachers are to adopt new technology-based teaching methods with confidence. By intrinsic aspects of teaching we mean essential practices that are not immediately apparent from outward inspection of the structure of a lesson or activity. Such aspects are not well captured or represented by conventional learning design because its technical origin has led to a focus on sequencing and structure. The need to represent intrinsic practices has become even more acute in the past couple of decades with the rise of social constructivist and situative approaches to teaching (see, for example, Mayes & de Freitas, 2004; Conole & Fill, 2005) and of web 2.0 technologies, which are widely seen as promoting a less directive role for the teacher (Dron, 2007; Selwyn, 2008). Advance sequencing and orchestration may even be mitigated against (Beetham, 2008; Pata, 2009), and the role of the teacher becomes to help learners to manage the contingency of living in a learning environment – a role in which familiarity with intrinsic aspects of teaching is crucial.

In a search for effective representations of intrinsic practices, we compare “practice models” with two alternative representations, “patterns” (Alexander et al, 1977; Dearden & Finlay, 2006) and “bundles” (Fincher et al, 2001). We discuss our experiences of using these on the Planet project, and with CETL ALiC. The relationship between the representations discussed in this paper is shown in Table 1. The table shows which characteristics are necessary in the representations (though representations may display characteristics that are not necessary, for example some practice models may show problem-solution pairs, while some patterns may show sequencing information).

<table>
<thead>
<tr>
<th></th>
<th>Generic</th>
<th>Sequence of activities</th>
<th>Problem-solution pair</th>
<th>Critical success factors</th>
<th>Can it represent non-</th>
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Figure 1: Relationship between the projects discussed (top row, bold) and mentioned (below) in this paper
<table>
<thead>
<tr>
<th>Learning Designs</th>
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<td>Patterns</td>
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<td>Bundles</td>
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Table 1: Characteristics of different representations of teaching practice discussed in this paper. The table shows which characteristics are necessary for the representation to be classed as a representation of this type (though representations may display characteristics that are not necessary, for example some practice models may show problem-solution pairs, while some patterns may show sequencing information). A representation showing a problem-solution pair has a form that states a problem and gives a solution to that problem; one showing critical success factors has a form that explicitly requires a statement of the conditions necessary if the solution is to be successful.

**Practice models**

**Overview of the Mod4L Models of Practice project**
The aim of the Mod4L Models of Practice project was to: “develop a range of practice models that could be used by practitioners in real life contexts and have a high impact on improving teaching and learning practice” (Falconer et al, 2007 p.2). The philosophy underlying the project was that a split in the e-learning community between technical developers, and research into how teachers can use technological tools most effectively, was impeding uptake of new tools and methods by teachers. To help overcome this barrier, and bridge the gap, a need was identified for teacher-focused resources that would describe a range of learning designs and offer guidance on how these might be chosen and applied; how they could support effective practice in design for learning; and how they could support the development of effective tools, standards and systems with a learning design capability (see, for example, Griffiths and Blat, 2005; JISC, 2006b). Practice models were proposed as such a resource.

Practice models were defined by the JISC as, “generic approaches to the structuring and orchestration of learning activities. They express elements of pedagogic principle and allow practitioners to make informed choices” (JISC, 2006b p.2).

However, as discussed above, the issue of representation of designs was central to the concept of sharing and reuse at the heart of JISC’s Design for Learning programme. Thus practice models needed to be both representations of effective practice, and effective representations of practice. This paper concentrates on the latter aspect – effective representations of practice.

The Mod4L project ran from May to December 2006. It took a teacher-centred approach, working in close collaboration with a focus group of 12 teachers to gather evidence on the usability of various forms of representation. Teachers were recruited across a range of
disciplines and from both further and higher education in the UK, and were chosen from those who were known, from their participation in innovative projects or teaching award schemes, to be interested in changing their practice. Information was gathered from the focus group through two face to face workshops, and through teachers’ contributions to discussions on the project wiki (http://mod4l.com/tiki-index.php). This was supplemented by an activity at a JISC pedagogy experts meeting in October 2006, and a workshop at the UK Association for Learning Technology Conference (ALT-C) in September 2006.

The project defined five stages of sharing and reuse of a learning design (i. browsing/searching a repository, ii. choosing a design, iii. developing/editing, iv. instantiation, v. reflection and feedback to repository), and evaluated nine different representational forms for usability in each of these stages (Falconer et al, 2007). The forms, chosen either because they appeared at the outset to be promising ways of representing learning designs to teachers, or because they were suggested by project participants, were:

1. Case studies, eg. the Otis case study collection (http://otis.scotcit.ac.uk/)
2. Video case studies, eg. the JISC Effective Practice guide (http://www.elearning.ac.uk/effprac/)
3. Controlled vocabularies, discussed by Currier, Campbell, and Beetham (2005)
4. Matrices/templates, eg. the LDLite matrix developed in Littlejohn & Pegler (2007)
5. Patterns, based on the architectural patterns of Alexander, discussed in McAndrew, Goodyear and Dalziel (2006)
7. AUTC temporal sequences, a graphical representation focusing on tasks, resources and supports (AUTC, 2003)
8. Flow diagrams, a graphical representation of a process using shapes and lines or arrows
9. LAMS, an electronic learning system that enables teachers to plan and deliver technology-supported learning activities with a drag and drop interface (http://lamsfoundation.org/).

Among the main conclusions of the project were that questions of audience, community and purpose are central to the effectiveness of a representation. Even within a single audience or community (teachers in this case), different representations are needed to meet different needs or purposes, and these needs change through a cycle of sharing and reuse.

**Critique of practice models as representations of practice**

Of the nine forms considered, the first two, case studies and video case studies, being heavily contextualised, are not candidates for representation of generic practice models. These contextualised representations are, however, the forms traditionally preferred by teachers when sharing innovative practice (Beetham, 2001, Sharpe et al, 2004). This highlights one of the major findings of the Mod4L project, that while practice models might provide teachers with the information needed to orchestrate learning activities and resources, they generally fail to inspire them to change their teaching practice, possibly because of the lack of contextual information (Falconer et al, 2007; Falconer & Littlejohn, 2008).

Returning to the initial definition of practice models, with the implication that these would support sharing, reuse and improved teaching practice, then they have at least three concurrent purposes. Practice models are expected to:

- Be generic
• Detail sequence and orchestration
• Inspire teachers to implement them and hence change practice

While there are plenty of examples to show that any two of these requirements can be realised together, achieving all three at once appears to be a holy grail. In the Mod4L project, we argued that this finding was the result of an unresolved dichotomy of purpose between representation for design, and representation for staff development (Falconer et al, 2007, Falconer & Littlejohn, 2008). Teachers seem to find generic sequences and orchestration generally unhelpful: they do not give sufficient insight into the dynamic process of instantiation and appear boring; contextualised examples are better at conveying this information, if only tacitly (Falconer & Littlejohn, 2006; 2008). This point is substantiated by reports from LAMS (Dalziel, 2006) and experience from the AUTC project which suggests that the ratio of contextualised to generic sequence downloads is around 10:1 (Lockyer, private communication). It was apparent in Mod4L that in order to adopt new practices, teachers not only needed to know how to orchestrate resources and activities, but they needed to be able to envisage themselves teaching the new design to optimise learning. As Beetham and Sharpe have pointed out, “learning can never be wholly designed, only designed for (i.e. planned in advance) with an awareness of the contingent nature of learning as it actually takes place” (2007, p.8). Mod4L teachers wanted to be confident that they could handle the contingencies that a new design might throw up.

We concluded that while practice models might represent effective practice, construed as sequencing and orchestrating activities, they were not effective representations of practice. Effective representations of practice had to find ways of representing the myriad of things that teachers do that bridge the gaps in the design, meet contingencies, and turn a sequence of activities into an effective learning experience. Following Goodyear (2005) we suggested that instead of viewing design for learning as producing a blueprint or design for a lesson, it would be more helpful to consider it as two loosely coupled processes, the intent or blueprint, and the action or operation, which are inextricably linked to each other. The teacher in the classroom frequently has little time to debate the action and calls on tacit and experiential knowledge developed largely through practice (Eraut, 2004; Falconer et al, 2007; Toulmin, 1999). Although it has been suggested that there is a greater separation between intent and action among e-learning practitioners, active involvement in instantiating a design remains evident even among e-learning practitioners. For example, Vogel and Oliver (2006 p.8), in assessing virtual learning environments, found that in discussing design, their practitioners “rapidly slid off into insights about the experience of running the designs”, and Masterman (2006), in evaluating generic design tools, found a requirement for flexibility in plans allowing for contingency action during the lesson. As Goodyear (2005, p86) notes, “it is not uncommon to find strategy [which may be decided in advance] which is really emerging from tactics [fine scale activity during run time]—thus strategy becomes a way of describing the common threads woven by intuitive tactical activity.”

The problem is that specifying how to instantiate the design requires capturing the intrinsic aspects of teaching. To help scope this problem we drew analogies to two other loosely coupled systems which capture certain aspects of the learning and teaching situation. As both analogies demonstrate, the blueprint (which might be a practice model or learning design) captures only one of the two coupled processes; something else is needed to capture the second, that is, the action or operation:

• A play script plus a troupe of actors. Here the play provides the blueprint – it specifies the roles, actions and interactions of the actors, director, etc (the teacher and
pupils). But there is still a huge difference between the performance put on by the Royal Shakespeare Company, and that put on by the local secondary school – the skill of acting and directing is not captured by the play script but is developed elsewhere and called upon by the demands of the script.

- A snakes and ladders board and a group of players. Here the board provides the blueprint for a lesson, and it contains some opportunities for accelerated progress, and also some pitfalls. What the teacher and pupils, as players, want to know is how to load the dice so that they land on ladders and avoid snakes. An effective teacher can do this and has a better than random chance of recognising and capitalising on opportunities as they present themselves.

When we consider these examples we can see why an approach to representing designing for learning, such as practice models, which provides nothing more than a blueprint, might be unpopular with teachers, and might constrain learners. It shows them a map for a lesson, but it provides no clue as to how to make their way effectively through the environment, because it is divorced from the other processes that enable an effective performance. As a Mod4L participant observed: “the best learning design can still result in dull mechanistic teaching so the link between different designs and the scope offered for staff and student engagement may also be one worth observing” (Falconer et al, 2007 p.10).

Findings from other projects reinforce the need to find ways of capturing and representing the intrinsic aspects of teaching practice. As Beetham notes in her evaluation of the Design for Learning programme, “... we have discovered that many of the technologies and standards in development point towards an ‘unprincipled’ future in which the purposes and processes of learning are determined largely by the learner. There are fundamental challenges here ... for curriculum design practice as a whole" (Beetham, 2008 p.15). These technological developments align well with social constructivist and situative teaching approaches in promoting a less directive role for the teacher, a role in which the function of a teacher at design stage may be to design an environment for learning; their function at implementation stage is to help students to manage the contingency of living and learning in the environment. Such environmental perspectives on learning design have been suggested by Metcalfe (2008), and by Pata (2009) who suggests a model in which teachers do not even assemble the environment, though they may facilitate its assembly by learners. In this sort of teaching, teachers need not only to understand the map of the environment, but also the principles and intrinsic practices that enable them to live in it effectively. An approach to representing teaching practice that focuses on mainly orchestration and sequencing thus fails to acknowledge crucial elements that would enable teachers to change their practice.

Patterns

Patterns and pattern languages

The Pattern Language Network (Planet) project ran from January 2008 to April 2009 and aimed to develop a community centred approach to eliciting and representing practice using patterns and evaluate this approach in the context of the community of practitioners using web 2.0 for teaching and learning (Finlay et al, 2009). Here, the emphasis was on representing intrinsic aspects of teaching practice, abstracting the elements considered essential to success from specific examples of teaching activity. The approach therefore
provides an interesting comparison to practice models, with their emphasis on sequencing and orchestration.

The pattern language approach is based on the work of architect Christopher Alexander. As defined by Alexander, a “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 et al, 1977, preface p.x). Or, as defined in the Planet project, “a pattern describes an effective solution to a recurrent problem embedded in a specific context and is characterised by being drawn from successful practice rather than from theory” (Finlay et al, 2009). A pattern has a well-defined format, and although different pattern collections differ to some extent, core elements are usually:

- name of pattern;
- a picture showing an instantiation of the pattern;
- description of the problem;
- statement of the context within which the problem-solution pair works;
- description of the solution (sometimes with a diagram);
- evidence or rationale for the solution, including examples of instantiations;
- links to related patterns.

Despite the semi-formal structure, a pattern can represent many types of design problem-solution pair, including intrinsic aspects of teaching practice. It is thus more flexible than a practice model: only if the problem is a sequencing problem will the pattern solution represent a sequence and count as a practice model; other patterns may represent other aspects of teaching. Thus the Planet project addressed some of the issues raised by the Mod4L project, in particular by focusing on representing practice, not just orchestration or sequencing, and by emphasising community involvement in eliciting the critical aspects of practice, in developing the representational form, and in embedding understanding of the use of the form (Finlay et al, 2009; Falconer et al, 2007; Falconer, 2007).

Any guidance as to orchestration of patterns comes from the structure of the “language” into which patterns are organised; the language is generative (Fincher, 1999), allowing for flexible and varied orchestration of patterns which may be at different levels from overarching “meta-patterns” to highly detailed “tips”. Three examples of patterns developed through the Planet project, and described below, illustrate this variety and flexibility.

The first, “Objects to talk with” (Box 1) defines a component of a process but not the whole process; it might be used at any appropriate point in an activity or activity sequence, or might be used throughout the entire sequence. It may, but need not, be used together with, “Sharing practice through structured storytelling” (Box 2). This latter pattern does define a process which, as noted, may be compressed or extended over a day. It relates to other patterns in different ways: those used to facilitate implementation of this pattern, or as a source of outputs that form the inputs of another pattern. Arguably, “Sharing practice through structured storytelling” might be considered as two linked patterns: the storytelling process that provides for reflective sharing; and the use of a “common simple structure” to facilitate the sharing by guiding participants to an appropriate level of granularity and to focus on success factors. The third example, “Start with introductions” (Box 3), like “Objects to talk with” is a component of a process, which facilitates the whole process. But unlike “Objects to talk with”, it is very specific about where in the process it comes – at the beginning. Note that
this last example is a “candidate pattern”, being developed but requiring more evidence before it can be judged a pattern with any degree of confidence.

**Box 1: Objects to talk with**
(note that for simplicity these examples do not show the full pattern format, only the elements necessary to illustrate the argument)

**Problem:** Natural, face to face, discourse makes extensive use of physical artefacts: we gesture towards objects that mediate the activity to which the discussion refers. This dimension of human interaction is often lost in computerized interfaces.

**Context:** This pattern is relevant to computerized interfaces which allow learners to converse about a common activity.

**Solution:** Learning activities involve the use or construction of artefacts. When providing tools for learners to discuss their experience, either as part of the activity or at a reflective meta-level, allow them to easily include these artefacts in the scope of their discussion. If the activity is mediated by or aims to produce digital artefacts, then the discussion medium should allow embedding of these artefacts. Whatever the nature of the objects, the medium should support a visual (graphical, symbolic, animated or simulated) 1:1 representation of these objects.

**Related patterns:**
May facilitate Sharing practice through structured storytelling

**Box 2: Sharing practice through structured storytelling**

**Problem:** Effective sharing of practice relies on people being able to share their personal experiences in a reflective manner, in a way that lends itself to examination by others, but to be useful such sharing needs to be focused, relevant, specific and highlight what has worked. However people can find it difficult to identify an appropriate level of detail or granularity and often focus on what has failed.

**Context:** This pattern works best where the group involved has a defined purpose for sharing practice. It can operate in anything from a 10 minute quick fire round to a full day workshop and works well both face to face and online.

**Solution:** Ask participants to represent their story of successful practice using a simple common structure, to present it in their own words to the larger group. Then have the larger group explore the details of the story and examine it to identify the factors that contributed to its success.

**Related patterns:**
Three Hats is one way to facilitate this pattern.
The output from applying this pattern forms the input for the Abstracting … pattern.

**Objects to talk with**

**Box 3: Start with introductions**
(an example of a “candidate pattern” that may become a pattern once more evidence is found)

**Problem:** When people join a group, they have expectation of finding help and being able to
work together. However, for this to happen, there has to be a mutual disclosure between participants of personality, expertise etc., specific to the group.

**Context:**

**Solution:** Make sure to start any collaborative activity with this period of disclosure. This is part of the key phase of establishing engagement of participants, that would include disclosure and negotiation. This could usefully be part of a specific session aimed at introductions. This could be through the facilitator indicating appropriate dimensions of this. If the group has the opportunity as a initial stage, it can achieve this through mutual interaction.

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**Overview of the Planet project**

Based on previous work (Fincher et al, 2001; Finlay et al, 2002) Planet adopted criteria for a representation that would be effective for sharing practice:

- transparent process of creation
- applicable in new contexts
- consistency of format
- clarity of context
- evidence of successful application
- meaningful to community.

Previous efforts to produce pedagogical patterns had focused around an expert group rather than community engagement and had not articulated a clear methodology for identifying patterns from practice (eg. PPTOT, 1998; Pedagogical Pattern Project, http://www.pedagogicalpatterns.org/). The Planet project aimed to address this situation by developing a community-based methodology for pattern elicitation that would provide transparency and meaning, enabling patterns to fulfil all six criteria (Finlay et al, 2009).

Planet adopted an iterative participatory approach to pattern development (Greenbaum and Kyng, 1991; Winters and Mor, 2008), where users and other stakeholders engaged in the design and development of patterns alongside the project team. The involvement of users in this approach is more active and intensive than would be the case for a consultation-only method and is more direct than simply involving users as evaluators and testers. In the participatory approach, users become active members of the design “team” and contribute to developments on an equal footing. The project ran with two specific user groups, who took part in – and participated in developing – a series of three participatory workshops for eliciting patterns and organising them into a pattern language (Finlay et al, 2009). The two groups were higher education teachers and researchers attached to CETL ALiC, and members of the JISC project in Formative e-Assessment (Pachler et al, 2009). Other, more ad hoc groups, came together for a number of one-off workshops. The resultant **Participatory Pattern Workshop** methodology (Finlay et al, 2009) covers pattern elicitation and use and is represented in Figure 2 where the oval boxes represent synchronous facilitated workshops and the rectangular boxes represent activity outside a workshop, either by participants, facilitators or both. The process begins with participants submitting “cases” of successful teaching practice to the group. These are represented as structured stories, where teachers provide a narrative covering the context of the practice, the problem being addressed, what was done, what was the result and what was learned. These cases are then presented and compared at the first workshop to identify commonalities and elicit essential elements. “Candidate” patterns are then proposed, which are refined (with reference to existing
patterns, external evidence and new examples) before the second workshop where participants work on the candidate patterns to develop full patterns, where they are confident that there is sufficient evidence that the solution offered is generalisable to a range of situations. The third workshop focuses on application of the patterns. Participants bring teaching “scenarios” and seek to apply the patterns to help them find solutions. This may lead into another iteration of the activity as the pattern language grows and is refined. The domain mapping activity, in which participants collaboratively develop a concept map of the pedagogic domain that the pattern language will focus on, is shown as a synchronous facilitated activity which may be included in or prior to any of the workshops, either as a workshop in its own right or a component of a workshop.

Figure 2: Diagram of the Participatory Pattern Workshop methodology (Finlay et al, 2009)

Critique of patterns as representations of practice

Refinement of proposed patterns from stories of practice, or “cases”, is a crucial component in the Participatory Pattern Workshop methodology, comprising two steps: initial identification of a successful practice, and refinement into a well-formed and evidenced pattern. The first step is well known to be difficult (eg. Retalis et al, 2006). However, evaluation of the Planet workshops, through user questionnaires and an analysis of the patterns produced (Falconer 2009) suggested that while the effort to abstract ideas for patterns from cases was successful and beneficial to participants as a means of sharing effective practice and eliciting tacit practices, refinement was more difficult and, participants did not generally develop an understanding of the pattern format as a representation of effective practice (Finlay et al, 2009). In fact, as discussed further in the Experience of CETL ALiC section below, after iteratively developing the pattern elicitation methodology over twenty workshops, including two complete cycles through the process shown in Figure 2, the Planet team decided that refinement of proposed patterns from the cases was too difficult for practitioners who were pattern novices; it was best done by pattern experts between workshops 1 & 2. In this, their experience concurs with that of the Learning Activity Design in Education (LADiE) project when developing use cases (which is another abstract representation of teaching practice) (Falconer, 2007).
In addition, there is a requirement for patterns to be validated by the “rule of three” (Hohmann, 1998; Appleton, 2000) – having at least three distinct cases where a given solution to a problem had been successful – which proved problematic within this methodology. Participants were asked to provide cases from their own practice, which led to many interesting cases, many potentially useful “candidate” patterns, but very few complete patterns that fulfilled the rule of three. From seventy-five proposals for patterns produced in workshops, only 20% were developed into full patterns by the end of the two-year project.

Thus, while patterns have the potential, outlined above, to represent all aspects of practice, and have the advantage of being generic and generative, it may be that the effort required by the teaching community to understand the format and give it meaning presents a major barrier to their adoption at present as effective representations of practice – at least as stand-alone representations (although they may have considerable value as a focus for interaction or dialogue).

Indeed, one of the Planet user groups, the CETL ALiC members, subsequently abandoned patterns as a representation and adopted a derived form known as “bundles” to represent their practice. The experience on this project is discussed in more detail next.

**Bundles**

**The Bundles representation**

Bundles are a representation devised by the Effective Projectwork in Computer Science (EPCoS) project (http://www.cs.kent.ac.uk/national/EPCOS; Fincher, Petre and Clark, 2001). The form was influenced by previous work on patterns (Alexander et al, 1977; Fincher, 1999), but recognises that teachers need certain information when deciding whether to take on a new practice. They need information about what the practice is, why it works and whether there are any pitfalls in its implementation. They need assurance that the practice represented has been instantiated elsewhere and has, in some sense, “had the bugs ironed out”.

The bundle representation, shown in Box 4, also consciously excludes categories of information that teachers do not need to consider. The EPCoS project found that teachers have little use for details of the originating context because teachers do not just pick up and adopt new practices unaltered; they adapt and change them, making them their own and tailoring them to their own context (Fincher, 2000). Equally, they do not need the ideas “packaged,” by being labelled to indicate intended use – “If you’ve got this problem, you’ll want to use this”. This proved to be ineffective. Practitioners know their own context and their own practices very well and have a very good sense of whether something will fit with their existing work. They do not need the originator to “second guess” their context for them. This attitude was corroborated in a recent consultation of senior UK academics regarding the creation of a repository of teaching-related material: “I think we have the ability to make judgements ourselves, we don’t need them made for us” (Blumhof, 2009, p6). This contrast to the findings of the Mod4L project, where context appeared important in inspiring practitioners to change practice, may possibly be explained by the different focus of bundles and practice models – on fine-grained intrinsic practice versus rather larger grained structure and sequencing.
Box 4: The bundle format (Fincher et al, 2001)

1. Problem Statement
Each bundle starts with a formulation of a general problem to which the body of the bundle is a specific solution.

2. Body
The Body of each bundle is presented in a format that shares certain formulaic phrases. These are:

- This Bundle: A phrase which captures the essence of the practice.
- The way it works is: A description of what is involved (this may be quite short, or many paragraphs long).
- It works better if: Key criteria for success.
- It doesn’t work if: Watchpoints for unsuitable (or undesirable) situations.

Every bundle has these. Additionally, they may be supplemented by:

- It doesn’t work unless: Points which are absolutely required.
- You’ll know it’s worked if: Ways to check that the desired result has been achieved.
- Variations: Other ways this might work (mostly, but not always, we have observed these “in real life”).

3. Solution Statement
Following the body of the bundle is a general solution which refers back to the initial problem statement.

Bundles are similar to patterns in that they are solution- and benefit-focused: neither form is used to represent ‘bad’ practice. They are intended to allow teachers to assess the benefits of the practice represented and decide whether it would be useful to adopt it. In this intent, they can fulfil one of the requirements of the Mod4L teachers – that the benefits of a new practice be clearly highlighted (Falconer et al, 2007).

Bundles differ from patterns in that they capture and represent specific, individual, pieces of effective practice. They do not need a variety of examples to abstract from (the “rule of three”) and they do not aim to illustrate an invariant aspect of “good” teaching practice. Bundles represent small pieces of practice in a form that makes them easy to apprehend and to adapt.

The Experience of CETL ALiC

CETL ALiC was a five-year project funded by the Higher Education Funding Council of England and involving the universities of Durham, Leeds, Newcastle and Leeds Metropolitan. Its remit was to promote more active approaches to learning, focused on sharing, problem solving and creating, within the discipline of computing. The project ended in March 2010 and during its final two years the team sought to find effective representations
to share the practice developed during the project beyond the consortium to the wider higher education community.

Initially the ALiC team adopted the Planet methodology with a view to representing practice as a collection of patterns, and an iterative series of workshops were held monthly over a period of a year to share stories of practice and attempt to elucidate and document patterns. The form of these workshops was primarily an iteration between Planet workshops 1 (cases to candidate patterns) and 2 (candidate patterns to patterns) although one workshop 3 (application of patterns) was held (see Figure 2). The structured storytelling activity in these workshops was particularly successful, with participants reporting that they had learned more about each other’s work through this, than in the previous three years of more traditional dissemination through conference presentations and papers. The process of preparing, sharing and discussing practice helped to clarify key issues, and highlight areas of success. These benefits are summarised by one participant:

Talking about particular case-studies or practices (sometimes my own and sometimes others) was really helpful in teasing out the similarities (or conversely, the lack of any similarities). … the value was really in the discussion as it helped me to focus on the significant factors (CETL ALiC workshop participant).

However the process of abstraction proved more difficult. Participants found it difficult to identify an appropriate level of abstraction and considered the pattern structure to be overly complex: “I found the concept of patterns quite difficult to grasp, I just didn’t ‘get it’” (CETL ALiC workshop participant). In addition, the nature of the practice developed through the project meant that, in most cases, there was only one example of the practice to draw upon. The scope for documenting full patterns was therefore limited.

Eventually the ALiC team decided to move to the simpler, more pragmatic approach of using a bundle-form, which focuses more directly on practice and requires only a single example. The work captured as patterns was translated into the bundle form using the stories previously identified. This “translation” was not, however, straightforward. Participants did not naturally relate to the minimal structure and did not appreciate the work that each part of the form had to perform. Participants became focused on themselves as producers: the audience for the bundles, and how they might access the practice represented in the bundle-form, was remote. This manifested itself as an unexpected problem: over-abstraction. The participants had developed a “scientising” notion of abstraction and generality; they had come to believe that the more generic their description, the more easily the practice they described could be disseminated, and as a consequence were omitting the very details crucial for useful sharing eg., “I think we got this feeling we had to make it as generic as possible so as many people as possible would use it” (CETL ALiC workshop participant). In one extreme case, there was in fact no practice at the heart of the representation, just a description of a simulation that had been created.

In response to this, participatory development of the bundle form took place, using the language and understanding that the ALiC participants had developed over the life of their project. The derived bundle form (see Boxes 5 and 6) retains essentially the same elements as the original (Box 4) but provides additional, contextualised, guidance on what should be included. It also adapts the language to reflect the understanding of the group better, replacing “problem” and “solution” statements which were alien to ALiC with terms emergent from their practice: “rationale” and “essence”. The body of the bundle is presented more explicitly as “description”, making it clear that this element is the narrative of the actual
practice, rather than an abstraction away from it. This participatory development of the bundle form has taken participants to a new notion of dissemination; rather than description of the general case being desirable, “the simple fact is that it works the other way” (CETL ALiC workshop participant) – the particular is of prime importance.

<table>
<thead>
<tr>
<th>Box 5: Revised bundle form for CETL ALiC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALiC Bundle Name (“snappy name”)</strong></td>
</tr>
<tr>
<td>• Here we try and capture succinctly what the bundle is doing or saying or advising, in a natural set of words “a well known phrase or saying”.</td>
</tr>
<tr>
<td>• &lt;If you’ve devised a “placeholder” name, something that’s descriptive, but not quite right yet, put it in pointy brackets&gt;</td>
</tr>
</tbody>
</table>

**ALiC keywords** (not part of the form, included for convenience): what aspect of active learning does this bundle exemplify?

**Rationale statement**

- The ALiC rationale statement helps orient a user: “This is why you need this practice”
- Do you have this issue? Can you identify with this situation?

---o0O0o---

**Description of Practice**

- Here we’re going to tell the story of what we actually did – what really happened. We’ll give specific examples and details.
- This is why the reader trusts us, because this is where we show we know the territory, we know what’s going on and we know what can go wrong.
- We’ll continue to use “signposting” – formulaic phrases that structure our stories. *this bundle is ..., it works better if ..., it doesn’t work unless ... etc.*

We’ll prompt each other (using the formulaic phrases) to capture these stories. “What does it do?” “What’s good about it?” “Why does it work?” “Why did it go wrong?” “What are the lessons here?”

We might additionally ask ...

- We did this in the ALiC context because …?
- What was easy at your site? What was difficult?
- We’ve done the same thing at different sites – should we capture that?

---o0O0o---

**Essence statement**

- This captures the essence of the practice, the “lessons learned”, the “take away”, the distilled notion.
- It complements the rationale. If we’ve described why a user might be interested in the practice in the rationale, in the essence we tell them what they have to do to achieve it – without all the specific implementation details that are contained in the “description”

“See also”: here is where we put things that link to other areas – smaller scale practices, or
perhaps another experience of this practice at another site, other ALiC bundles, certainly, but other resources too – papers and materials. Thus the “see also” sections instantiates a **network of bundles**: some will reference each other, some will form chains, some will point to the same papers, all forming links.

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**Box 6: Example of a bundle from CETL ALiC**

**Pay it Forward**

**ALiC keywords** project work, knowledge transfer

Students learn invaluable lessons that are then lost from one cohort to the next.

——o0O0o——

**Description of Practice**

The level-three undergraduate students undertaking the Project Management module are tasked with managing a level-two undergraduate team engaged in the Software Engineering team project. The level-three students will have experienced the team project in the previous year. The ‘project managers’ combine their past experience of team work together with their current study in project management to support the level-two students in their team project. As part of the on-going summative assessment of the level-three students they must record the problems they have encountered when managing the level-two team, the solutions they applied, and the results of their efforts.

The information is captured in a pattern i.e. in a formal structure used to capture a solution to a common problem within a specific domain. Collectively the patterns from all level-three students currently enrolled in Project Management are then shared with their peers. The first year that this is done a pattern language for team project management begins to emerge. The collection of patterns are then stored and then shared with the following year’s Project Management cohort. This next cohort are then tasked with enhancing the collection of patterns: by provided more examples to existing patterns; fine tuning existing patterns; and adding new patterns. The pattern language is refined and increased each year thereby passing on lessons learned.

Lecturers are able to take patterns developed by students and integrate them into the course of lectures which helps student to see the value of their work as well how to improve it. The mechanism we put in place to facilitate the capture and sharing of patterns was a blog which was restricted to the level-three Project Management students and associated staff. However, we believe a wiki or asynchronous discussion forum would be equally effective.

**It only works** if the patterns are reviewed to ensure the anonymity of contributors and filtered for wrong or inappropriate content.

**It doesn’t work** if the captured knowledge is unstructured, voluminous and messy.

**It works better** if there is a process for refinement and structure when passing the patterns to the next cohort.

---
It works better if the tool provided to capture lessons learned is intuitive and accessible.

——o0O0o——

So if you want students to share knowledge across cohorts create a mechanism that will allow them to share, refine, and increase the knowledge from one cohort to the next.

See also:

The new bundle form has been adopted by the group and has proved to be very effective in supporting them in articulating the bundles to re-incorporate the details of their practice, providing a representation more meaningful to them: “writing the bundles helped me to capture what worked and what didn’t in a much more succinct (and useful) manner” (CETL ALiC workshop participant). This illustrates again the need for representations to be meaningful to the community producing them and may indicate that local adaptation can reap benefits.

The initial bundles produced have been shared with a second Centre for Excellence in Teaching and Learning, the Institute for Enterprise (http://www.leedsmet.ac.uk/enterprise), who immediately understood the practice being shared and as a result decided to adopt the form to represent their own practice. This is promising but work is ongoing to assess whether the bundles produced using the revised structure, by the ALiC team, prove to be effective representations that are meaningful for practitioners beyond the consortium.

Discussion

Beetham (2001) implies a distinction between representations of practice and representations of learning, which might equate to a distinction between representations originated by teachers and representations originated by educational theorists or developers. This points out clearly that while the intended end users of a representation of practice may be the same – teachers – the originators may be different, with different motivations and different conceptual backgrounds, and this difference has implications for the representations used.

In this respect the projects discussed in this paper differ. JISC’s Design for Learning programme explicitly aimed to bring together technical developers or education researchers and teaching practitioners. Thus the implicit role of practice models was to be mediating representations or artefacts that served as boundary objects between the developer or researcher and teacher communities. (For a discussion of the distinction between mediating representations and artefacts see Falconer, 2007). Boundary objects are common to the communities between whom they mediate; they are recognisable to both communities but are viewed in different ways by them (Star, 1989; Wenger, 1998; Tuomi-Grohn & Engestrom, 2003). They act to bring about coordination and negotiate understanding between the communities. The emphasis in practice models on orchestration and sequencing arises from this role and evidences the interests that make them recognisable to the technical developer.
community. However the experience of the Mod4L project suggests that practice models as a representation are not sufficient to bridge the gap between the two communities – more is needed for teachers to adopt the new practices – in particular communication and interaction around the representation(s) are necessary. This experience agrees with that of the LADiE project, which found that several stages of communication and representation were necessary to bridge this gap (Falconer, 2007).

Conversely, the Planet project aimed to develop patterns, and CETL ALiC, subsequently bundles, as representations to be used within the teaching community; originators and end-users would differ only to the extent that originators had developed an effective practice that end-users had not yet acquired. This difference in aim gave the project participants much more freedom to consider any aspect of practice that was of interest to teachers, without the need to focus specifically on aspects of interest to non-teacher communities such as developers. Planet’s use of patterns and a developing pattern language was thus less constrained than that suggested by Goodyear (2005) and McAndrew et al (2006) who focused on the relationship between patterns, design, and Learning Design, and necessarily began to reflect the interests of the developer community in learning designs.

The effective use of patterns is dependent on teachers being able to find an appropriate pattern, at the pertinent time, as they design their teaching. This requires the patterns to be organised in a way that highlights their relationships both to the design process and to each other. Orchestration and sequencing for learning design may be one way of organising the patterns, as discussed by Goodyear (2005), but does not easily accommodate all the patterns relevant to practice, even the limited examples from the Planet project discussed above. Planet trialled a number of other organising structures, such as Laurillard’s (2002) conversational framework, Black and Wiliam’s (2009) matrix of factors in formative assessment, and some simpler, user-developed, matrices. A simple matrix approach appeared the most promising, but further work is needed to evaluate fully and assess whether these are scalable as the number of patterns increases (Finlay et al, 2009).

A pattern language may become highly sophisticated, and capable of generating complex designs, but our experience suggests it is not easy for teachers to develop. The implicit payoff found in CETL ALiC project between the ease of development of bundles, and the generative complexity of an abstract pattern language, parallels that between the acquirability and expressiveness of a representation noted by Boose (1990); for example a language that is sufficiently sophisticated to convey complex ideas may be difficult to acquire, while a more basic language is easier to learn but lacks the power to express complex concepts or fine distinctions between concepts. A related payoff is that between information density and adoptability in resources for teachers found by Beetham (2001) and Conole (2006). Beetham suggests that such counter-positions are driven by lack of time; teachers simply do not have time to become adept users of complex representations. In the case of patterns versus bundles, the time comes both in the effort required to abstract across numerous examples to develop patterns, as well as in that to organise into an effective structure.

Practice models, patterns and, to a lesser extent, bundles, are abstract representations of practice, and all have been used, in the projects discussed here, as a focus for sharing experience within communities of users. Despite the difficulties, the process of abstracting from practice to representation within a group was clearly very valuable to users. It gave them a participatory structure that stimulated sharing of experience in a well focused manner. The effort to abstract, in itself, stimulated debate and realisation of the critical features of
case stories even when the outcomes were not high quality patterns or models (Falconer et al, 2007; Finlay et al, 2009). The value of abstract representations in facilitating synchronous collaborative development and sharing of teaching practice is one that deserves further study. It has been remarked on previously by Sharpe et al (2004), and is implicated in questions Beetham (2008) raises in her review of the JISC Design for Learning Programme. However, it should also be noted that over-abstraction, in the case of the CETL ALiC practitioners, reduced the value of the resulting representations when they lost the narrative element and the specificity of the practice. The level of abstraction that is useful therefore also needs consideration.

Conclusions

We have argued that the effectiveness of practice models or generic learning designs, when conceived as a representation to assist teachers in sharing practice in technology enhanced learning, is constrained or compromised by the dual origins of learning design and the need to accommodate the interests of technical developers as well as of teachers. They may, however, have value as a mediating representation around which dialogue between developers and teachers takes place.

Teachers cannot rely solely on pre-planned sequencing for effective practice; they need also to be able to represent and share the intrinsic practices that have traditionally called upon their tacit knowledge. This need becomes even greater in an increasingly web2.0 and constructivist environment which encourages a less directive role for the teacher.

Each of the projects discussed in this paper have begun with the aim of producing a representation, for example, a practice model, pattern or bundle, that could stand alone, and that users could adopt and use without further assistance. The experience of each, however, has suggested that perhaps the most effective use of the representation is as a focus of collaborative discussion through which practice is shared between teachers. Whether an intensive process of user-participation and communication around forms such as pedagogic patterns and bundles is a necessary condition for effective development and sharing of new learning designs based on effective pedagogic practice deserves further investigation.

Acknowledgements

The authors wish to thank the funders and teams involved in the projects discussed in this paper: Mod4L, funded by the UK Joint Information Systems Committee (JISC), co-directed by Allison Littlejohn and Isobel Falconer, with Helen Beetham, Lori Lockyer and Ron Oliver; Planet, funded by the UK JISC, directed by Janet Finlay, with Jim Hensman, John Gray, Yishay Mor, Stephen Warburton, Isobel Falconer, Jakki Sheridan-Ross and Andrea Gorra; CETL ALiC funded by HEFCE, led by Liz Burd, with Janet Finlay, Roger Boyle, John Gray, Gill Harrison, Jakki Sheridan-Ross, Andrea Gorra, Royce Neagle, Janet Lavery, Andy Hatch, Phyo Kyaw, Marie Devlin involved in the representation activity. Sally Fincher provided support in the adaptation of the EPCoS bundle form.
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