Handbook of Research on Learning Design and Learning Objects:
Issues, Applications, and Technologies

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Chapter VII
Patterns and Pattern Languages in Educational Design

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ABSTRACT

This chapter provides an overview of recent research and development (R&D) activity in the area of educational design patterns and pattern languages. It provides a context for evaluating this line of R&D by sketching an account of the practice of educational design, highlighting some of its difficulties and the ways in which design patterns and other aids to design might play a role. It foregrounds a tension between optimising design performance and supporting the evolution of design expertise. The chapter provides examples of recent research by the authors on design patterns for networked learning, as well as pointers to complementary research by others. Connections are made with R&D work on learning design and other approaches to supporting design activity.

INTRODUCTION

Slowly but steadily, the core concerns of teaching are moving from the exposition of content to the design of worthwhile learning tasks. The nature and causes of this shift are contested, but one strong driving force is the changing nature of employment: the replacement of unskilled and semiskilled routine work with work that demands flexibility, creativity, and specialist knowledge. The volatility of employment and of the labour market combined with the strengthening of ideologies locate responsibility for learning and skills development firmly with the individual, to create a climate in which capacities for lifelong learning become crucial. Constructivist pedagogies, which centre on learners' involvement in actively constructing their own knowledge, are coming into alignment with capitalism's paradoxical need for more autonomous learners (Longworth, 1995; Stewart, 1998; Urry, 2003). Neither radical constructivism, nor classic instructional design, are much help to the teacher who needs to design tasks that challenge learners to take an active part in knowledge construction (Goodyear, 2000).

Educational design is complex and challenging. Empirical research suggests that teachers at all levels of education find it difficult and that the outcomes are often unsatisfactory (Bennett, Desforges, Cockburn, & Wilkinson, 1984; Hoogveld, Paas, Jochems, & van Merrienboer, 2002; Kirschner, Carr, van Merrienboer, & Sloep, 2002). There have been several lines of response to this problem. One approach has been to provide teachers with computer-based tools that are intended to provide support for their design activity (see, e.g., Elen, 1998; Goodyear, 1997; McAndrew, Goodyear, & Dalziel, 2006; Pirolli, 1991; Spector, Polson, & Muraida, 1993). In general, these tools are meant to carry some of the cognitive load entailed in solving complex design problems. In principle, this allows teacher-users to concentrate on what they know best, while delegating other parts of the design work to the computer. The sharing of load happens in various ways. In some cases, the tool manages the overall structuring of the design task, leading teachers step-by-step down a design path and asking them to fill in details. In other cases, teachers provide an overall logic or general specification for a design, and the computer does the detailed tactical work of sequencing or helps locate relevant units of learning material or learning objects (Barrese, Calabro, Cozza, Gallo, & Tisato, 1992; Goodyear, 1994; Gustafson, 2002; McAndrew et al., 2006). In many cases, the underpinning philosophy (implicit or explicit) is to support performance rather than understanding. That is, the primary goal of most of these approaches is to improve the outcome of the teacher-user's current educational design task. If the teachers also learn something that will help them improve as an educational designer that is seen as a useful by-product. When performance improvement is the primary goal, the teachers and the evolution of their understanding of design take second place.

The approach we summarise in this chapter embodies different values. We do not undervalue improving the performance of teachers on educational design tasks. However, we do value the growth of the teacher's personal understanding of educational design. We are looking for ways of supporting both understanding and performance, striking a good balance between the two. The approach we describe here gives a central place to educational design patterns and pattern languages. Our aim is to provide an introduction to this way of framing educational design and to summarise key ideas and achievements in the literature. Space limitations prevent us from giving many examples of educational design patterns, but we will provide some illustrative examples from our own recent work on design patterns for networked (collaborative online) learning in higher education. The reference list provides pointers to much of the literature on educational design patterns, particularly where the work relates closely to learning with the aid of technology. In the next section, we provide an introduction to design patterns, their origins and recent evolution and give some suggestions about useful supplementary literature on their use in education. After that, we summarise some aspects of our own recent work on design patterns for networked learning. The chapter concludes with some thoughts about promising lines of research and development work.

BACKGROUND

Learning Activity and Educational Design

We use the term 'educational design' to mean the set of practices involved in constructing representations of how to support learning in particular cases (Goodyear, 2005). Much of the literature talks about 'instructional design,' but we prefer the word 'educational' because it avoids some of the narrow connotations of 'instruction.' The term 'learning design' has much currency, partly because it foregrounds learning rather than teaching or instruction. But like the cruder talk of 'delivering learning,' it subtly suggests that we can help learners abdicate their responsibilities for learning. We cannot. Therefore, we stick with 'educational design,' even though we mean it to stretch well beyond the normal confines of formal education.

Educational design is largely a matter of thinking about good learning tasks (good things for learners to do) and about the physical and human resources that can help learners succeed with such tasks. In our view, it should focus on the learner's activity rather than on content coverage, selection of technology, or consideration of what the teacher might do. In some learning contexts, such as safety-critical training, some areas of industrial or military training, or areas in which there is a clear consensus about how something should be done, it can make a lot of sense to approach educational design with the hope that the learner will do what you tell them. In most other cases, it is unwise to assume a 'compliant learner.' Indeed, becoming an autonomous learner depends upon repeated opportunities for exercising disciplined creativity in interpreting the requirements of educational tasks. This introduces an extra layer of complexity into educational design; it becomes more *indirect*. To clarify this, we need to distinguish between learning outcomes, learning activities, and learning tasks (cf. Goodyear, 2005). Learning outcomes are the durable, intended, and unintended cognitive, affective, and psychomotor consequences of the learner's activity (mental and physical). Learning outcomes usually entail additional capabilities or understanding, or both. What matters here is *what the learner does* (Biggs, 2003; Shuell, 1992). The quality of the learner's activity is key. Tasks are set by teachers/designers. They are resources for activity, rather than prescriptions of it. The learner, in the legitimate exercise of autonomy and creativity, will take a task specification and *interpret* its requirements, using this as an opportunity to steer the work towards things that seem to them more interesting, valuable or doable.

We acknowledge that this is an unusual view of the relations between task design and learning outcomes, and that it is also underpinned by a traditional, even dated, cognitivist view of learning. It looks more familiar, even up-to-date, when repainted in sociocultural colours. All we are saying is that *activity is key* and that what anyone does to support learners in their activity has to acknowledge the importance of the learner's freedom of action. It may well be best to view what learners do as some kind of legitimate though peripheral participation in the work of a community of practitioners of some kind (Lave & Wenger, 1991; Lockyer, Patterson, Rowland, & Hearne, 2002; Maynard, 2001). Their induction into the working practices of the community still involves action and guidance and access to appropriate tools and helpful people. The *activity* cannot be designed. Tools and helpful people *may* just come to hand, but they may not, especially for students who are disadvantaged in any way. So when teachers in formal education make use of 'community of practice' metaphors, or otherwise invoke the power of situated learning or learning through apprenticeship, they *do* need to ensure access to the technical and human resources the learners will require. This is a nontrivial challenge, one that needs the kind of planning and careful thinking we call design.

DESIGN AS A CONVERSATION WITH MATERIALS

Donald Schon, in an interview with John Bennett, talked about design as a reflective conversation with materials (see, e.g., Schon & Bennett, 1996):

It is rare that the designer has the design all in her head in advance, and then merely translates it. Most of the time, she is in a kind of progressive relationship—as she goes along, she is making judgments. Sometimes, the designer's judgments have the intimacy of a conversational relationship, where she is getting some response back from the medium, she is seeing what is happening—what it is that she has created—and she is making judgments about it at that level. One form of judgment in which I'm particularly interested is the kind that I call backtalk, where you discover something totally unexpected—'Wow, what was that?' or 'I don't understand this,' or 'This is different from what I thought it would be—but how interesting!' Backtalk can happen when the designer is interacting with the design medium. In this kind of conversation, we see judgments like, 'This is clunky; that is not,' or 'That does not look right to me,' or just 'This doesn't work.' The designer's response may be 'This is really puzzling,' or 'This outcome isn't what I expected—maybe there is something interesting going on here.

In their summary of the outcomes of empirical studies of experienced educational designers, Paul Kirschner and colleagues arrive at elements of a similar view: 'instructional designers, in practice, *design highly solution-driven, context-sensitive solutions through an iterative and integrative process*' (Kirschner et al., 2002, p. 93; emphasis in original). This provides the background for the following sketch of educational design in practice:

1. Educational design takes time. It rarely starts with a clear, complete conception of what is desired. Instead, the designer tries out various ideas, inscribing them in the world in some way (e.g., in a notebook, in a prototype). Over time, there is a convergence on a solution which entails both a clearer realisation of what is needed and what should be done to meet that need. Schon's 'backtalk' helps here.
2. This process of iterative clarification of the nature of the problem and its solution involves complex thought; from time to time, it overloads the designer (Frizell & Hubscher, 2002). At such times especially, designers have to share the cognitive effort of design by using resources in their design environment. Such resources include things designers have produced: notes, part-finished designs, prototypes, and so forth. They also include resources produced by others: templates, guidebooks, general principles, and so on. In short, designers can cope with complex problems that would otherwise overwhelm them by distributing the cognitive work (entailed in design) across minds, tools, and texts.
3. Thought is fast. Coordinating and consulting resources external to the mind takes time. The development of expertise as a designer involves, in part, an internalisation of ideas (etc.) found in texts and tools, as well as a restructuring of one's design knowledge, such that lower level design processes can be tackled automatically (without much conscious thought). In this regard, design expertise is just like other forms of expertise (Chi, Glaser, & Farr, 1988; Etelapelto, 2000).

This sketch provides a framework for evaluating the likely usefulness of a design resource for a teacher-designer. In particular, we would prioritise resources that encode design-relevant knowledge such that it is both easy to use and easy to internalise. It should be easy to consult while stuck on part of a problem. It should be vivid, understandable, memorable, and suited to easy recall in times of need. In our view, design patterns meet both needs: their form makes them usable *and* learnable. However, this is still a claim, not a proven fact. One of the purposes of our chapter is to see how this claim might be evaluated in the light of current literature.

DESIGN PATTERNS AND PATTERN LANGUAGES

A design 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, Silverstein, Jacobson, Fiksdahl-King, & Angel, 1977, p. x). The idea of design patterns comes from the writings of Christopher Alexander and his colleagues, working in the area of architecture and town planning. Design patterns can be combined to form a pattern language, tailored to the requirements of a particular task such as designing an extension to a house or designing a new program of study.

Figure 1 shows the conventional abstract structure of a design pattern. Figure 2 fills this out with content taken from the area of educational design for networked learning.

The words and phrases in capitals at the start and end of the pattern show how it may fit into one or more pattern languages. For example, this pattern references both a higher level pattern (LEARNING THROUGH DISCUSSION), which it can help complete, and also some lower level patterns that help complete or elaborate it (e.g., FACILITATOR).

RECENT WORK IN THE AREA

Current work on design patterns in educational technology has two main roots. One set of origins can be traced back through the interest of software engineers in design patterns (Gamma, Helm, Johnson, & Vlissides, 1995). Some of these software engineers were also university teachers of computer science or industry trainers and began to experiment with 'pedagogical design patterns' as a way of capturing and sharing ideas about teaching (Sharp, Manns, & Eckstein, 2003). Also, some more technically oriented educational technologists began to draw on the work of the

Figure 1. Internal structure of a design pattern (based on information in Alexander et al., 1977)

An introductory paragraph setting the context for the pattern (explaining how it helps to complete some larger patterns)

◆◆◆
(to mark the beginning of the problem)

A headline, in bold type, to give the essence of the problem in one or two sentences

The body of the problem
(its empirical background, evidence for its validity, examples of different ways the pattern can be manifested)

The solution, in bold type. This is the heart of the pattern – the field of physical and social relationships which are required to solve the stated problem in the stated context. Always stated as an instruction, so that you know what to do to build the pattern.

◆◆◆
(to show the main body of the pattern is finished)

A paragraph tying the pattern to the smaller patterns which are needed to complete and embellish it.

Figure 2. Example design pattern (based on information in Goodyear, 2005)

Discussion group

This pattern is mainly concerned with the establishment of appropriate organisational forms for knowledge-sharing, questioning and critique. It is a way of helping implement the patterns LEARNING THROUGH DISCUSSION, COLLABORATIVE LEARNING and NETWORKED LEARNING PROGRAMME.

◆◆◆

Discussion groups are the most common way of organising activity in networked learning environments. The degree to which a discussion is structured, and the choice of structure, are key in determining how successfully the discussion will promote learning for the participants.

Discussions can be relatively structured or relatively unstructured, and they may also change their character over a period of time. It is not uncommon for a teacher to set up a discussion in quite a formal or structured way, and for the structure then to soften as time goes by – for example, as the participants take hold of the conversation, opening up and following new lines of interest.

The structure of a discussion should be such that it increases the likelihood of:

a) an active and substantial discussion, with plenty of on-task contributions

b) the students coming away from the discussion with a good understanding of the contributions made

c) contributions being made by all members of the group and 'listened' to by all other members of the group.

Unstructured discussions run the risks of (for example)

- not getting going properly within the time available
- dissipating into a number of loosely related strands that fail to engage effectively with subject being studied
- dissolving into monologues or two-way conversations that fail to involve the whole group (Wertsch, 2002).

Pilkington & Walker (2003) have demonstrated the value of assigning explicit group roles in online discussion groups. Some writers, for example, McConnell (2000) are not sure about the validity of the teacher setting specific structuring devices, preferring to make the group itself responsible for determining how it wants to discuss things, or carry out its work more generally.

Therefore:

Start any online discussion by establishing its structure. Make the rules and timetable for this structure explicit to all the members of the group. Where there is little time available to the group for the discussion, and/or the members of the group are inexperienced at holding online discussions, the teacher/facilitator should set the structure. Where the students are to set their own structure, the teacher/facilitator should give them support and ideas about how to do this, and encourage them to do so in a fair and timely way.

◆◆◆

Patterns needed to complete this pattern include: DISCUSSION ROLE, FACILITATOR, DISCURSIVE TASK

software engineering patterns community—a line of development described very well by Garzotto and Retalis (this volume) and exemplified in Lyardet, Rossi, and Schwabe (1998) and Avgeriou, Papasalouros, Retalis, and Skordalakis (2003). The other set of origins can be found in work on tools and methods to support educational designers (e.g., Goodyear, 1997; Gustafson, 2002; Spector et al, 1993) and particularly the branch of this work that tries to relate to contemporary conceptions of learning as something which is complex, physically and socially situated, creative, and emergent (Davis & Sumara, 1997; Goodyear, 2002; Jessop, 2004; Rohse & Anderson, 2006). An important theme in this line of work has been the search for conceptions of design, and underpinning knowledge bases, that acknowledge the need for learners to play a strong part in directing their own learning and shaping their own learning environments. Design ceases to be concerned with channelling learner behaviour. It becomes more indirect, proposing challenging learning tasks; seeing that the learning environment is stocked with appropriate tools and resources (that learners can select, customise, and reconfigure); and doing what can be done to help the formation of convivial learning relationships. This can be seen as a shift in design logic from a logic of control to a logic of affordances (Goodyear, 2000; Hall, 2002; Kreijns, Kirschner, & Jochems, 2002). Product design, ergonomics, architecture, and ecology turn out to be very fertile sources for rethinking educational design and the complex relationships between people, activities, and technology (Goodyear, 2005; Hannafin & Hannafin, 1996; Nardi & O'Day, 1999; Norman, 1990).

Sharp et al. (2003) offer a balanced and reasonably up to date summary of the work of the Pedagogical Patterns Project (PPP). The paper mentions the four pattern languages on which members of the team have been working: feedback, active learning, experiential learning and gaining different perspectives. (More information about each of these can be found on the PPP Web site.) The paper also talks about the project team's decision to change the format of its patterns from the style popular in software engineering (e.g., in Gamma et al., 1995) to one more closely resembling Alexander's 'literary' form. Sharp et al. contend that the Alexandrian form improves the readability of the patterns and helps the reader avoid getting bogged down in detail (pp. 322-323). We would say that the shift to an Alexandrian form is a shift in emphasis from usability to learnability, from performance to understanding. We do not want to argue that this is good or bad; rather, it is a question of emphasis and purpose. More formal structuring makes some design (sub)tasks easier—like browsing or searching for relevant patterns—but it can make it harder to understand the rationale or deeper nature of a pattern and its connection to other patterns. Some of the meaning of a pattern derives from these relationships with other patterns.

Fincher and Utting (2002) have been quite critical of the PPP.

Pedagogical patterns still lack widespread acceptance. …they are so abstracted from the domain (of tertiary computer science education), and therefore generic, that they lack insight; or they are so tightly coupled to specific instances of practice that they are not transferable. The chosen form(s) lack some of the elements that provide patterns with their peculiar communicative power; sometimes they capture practice which is obvious, sometimes the lack of a value system [makes] it difficult to generate new designs from the solutions they propose. (p. 201)

The criticism of form predates the PPP's shift to a classic Alexandrian format. But some of their other criticisms remain trenchant. Table 1 is an elaboration of ideas in Fincher and Utting. It is an attempt to diagnose some of the problems with conceptions of pedagogical patterns involved in the PPP approach, and to say something about what pedagogical patterns *should* offer, by specifying some functional and nonfunctional requirements.

Our own doubts about the lack of success of the PPP to date echo those of Fincher and Utting (see also Garzotto and Retalis, this volume) but we have a deeper worry. It connects with the requirements that patterns should not be 'obvious,' and should provide insight. It is impossible to explain this concern without sounding arrogant, because—in essence—we would contend that the work of the PPP is an attempt to distil the experience of inarticulate amateurs. Carl Bereiter (2002) has argued eloquently that discussion of educational policy and practice is trapped in the language and mindset of a 'folk psychology' that (for example) sees the mind as a container to be filled and teaching as the practice of filling that container. This 'folk psychology' entails many other powerful and damaging beliefs that restrict serious discussion of the practical implications of recent discoveries in the learning sciences. Alexander and his team were able to construct convincing patterns because they were skilled in the *analysis* of built form. They were able to combine mathematical, social, moral, and aesthetic approaches to analysis, drawing on years of professional training and practical experience. They began with, and were able to sharpen, language and other representational devices suited to the tasks of deconstructing built form. University teachers do not typically have such tools and sensibilities (in their role as teachers, that is).

Nor is there a community of university teachers with a common pedagogical language or shared set of robust pedagogical constructs to serve as an imagined audience for a pedagogical pattern book. As Tom Erickson might have observed that university teachers do not have a *lingua franca* for pedagogical design (Erickson, 2000). *Serious* progress in the use of pedagogical patterns

Table 1. Requirements for educational design patterns (based on information in Fincher & Utting, 2002, and adapted and extended by the authors)

Functional requirements	**Nonfunctional requirements**
Capture of practice A pattern is not about an idea, or something that might be, or should be. It is about something that exists in the world. The thing exists because it solves a problem. There may be many variations of this thing, but they will share an invariant property that is essential to solving the problem concerned. NB problems of design are usually problems of reconciliation, of finding a balance between forces that are in tension.	*Non-obvious* Patterns help explain *why* things that succeed are successful at solving the problems they solve. Rather than expressing implementational detail, patterns help bring to the surface aspects of the world and the way it works that we often take for granted or fail to notice.
Abstraction Examples which are too concrete do not help people solve problems which are related to the example but appear disconnected from it. Principles which are too general are very difficult to apply to specific problems. Finding the right level of abstraction is key to crafting a good pattern.	*Insight* Good patterns provide insight into the rationale for a solution.
Value Systems Patterns express good ways of doing things, not just any old way. This necessitates being explicit about what is valued.	
Structuring Principle The links between patterns are at least as valuable as the patterns themselves. A structuring principle is what organises a set of patterns into a whole (a language).	*Generative* Patterns do not 'automagically' produce design solutions. Rather, the structuring principle helps the user find an appropriate pattern and the driving force of the value system helps generate a complete design, expressing 'a certain way of doing things.'
Presentational Form The presentation of the pattern is not the pattern. (The map is not the terrain.) But the presentation of a pattern is significant. Presentational forms vary from one set of patterns to another, but there is an irreducible core of problem statement, solution statement, and rationale.	*Communicative Power* The name of a pattern can become key to its success; if the name enters the lingua franca of a design community (as a shorthand for what the pattern expresses), then it may take on a life of its own. Good names for things we previously struggled to describe (or even see) are particularly powerful.

depends upon developing shared language and understanding.

A number of authors have tried to analyse the relationships between work on pedagogical patterns and developments in the learning design area (e.g., De Moura Filho & Derycke, 2005; McAndrew et al., 2006; Turani, Calvo, & Goodyear, 2005). The essence of De Moura Filho and Derycke's (2005) argument is that pedagogical patterns and learning design are complementary. In their view, pedagogical patterns primarily have a communicative function and should always be expressed in a textual form that teachers-as-designers can read and write. It would be a mistake to express them in a form, such as pseudocode, that would be inaccessible to teachers who were not also programmers. It would also be a mistake to automate them (p. 114). De Moura Filho and Derycke explore the connection with learning design by showing how parts of a selected pedagogical pattern can be mapped onto learning design elements (roles, activities, learning objects, etc.). They conclude that the best mapping can be achieved by working from a pedagogical pattern to a learning design *template*, rather than to a fully-fledged learning design *scenario*. This idea of using pedagogical patterns at higher levels of abstraction can also be found in Turani's work on computer-supported collaborative learning (CSCL) with the Beehive system (Turani et al., 2005). Turani's approach involves four levels of abstraction: collaborative pedagogical models, pedagogical techniques, collaboration tasks patterns, and CSCL tools. Pedagogical patterns *could* be written for elements at each of these levels, but they lend themselves to the higher levels of abstraction. Finally, McAndrew et al. (2006) explore convergences and discontinuities between learning design, the LAMS (learning activity management system) and the patterns-based approach. Again, there is a sense of complementarity rather than competition, and a notion that patterns are best suited to sharing of, and reflection on, educational design ideas by teachers, while LAMS and learning design are more supportive of downstream activity—detailed design and development work, supported as appropriate by technical experts.

We think this analysis can be taken further. Going back to Schon's powerful image of design as a conversation with materials, we are struck by the scale of the imaginative leap that teachers-as-designers have to make when tackling educational design work. The leap from pedagogical pattern to actual student activity can be enormous, but is manageable if the activity is familiar and its relations with other activities and resources are few and simple. As soon as the design becomes complex, then imagining the learning activity and learning environment in any detail becomes cognitively demanding. Evaluating one design choice against another becomes very difficult. Opportunities for Schon's 'backtalk' disappear. In fact, one thing that happens is that teachers short-circuit the design work and move too rapidly to development commitments—that is, they make premature commitments to use *this* learning object, or *that* tool, for specifically *that* task. Some tools—LAMS would be one of them—provide more abstract design representations that allow the teacher-as-designer to try out some design commitments, reflect on their appropriateness, and make changes as they see fit. This is closer to the iterative 'tinkering and reflection' kind of process that Schon describes. Crucially, it depends on having appropriate forms of representation at key levels of abstraction. One needs a pattern book, as well as computer-based tools for creating and manipulating graphical and other representations of provisional design ideas. Alternatively, one needs a much tighter coupling than we can currently conceive for educational design between computer-aided design and computer-aided construction of tasks and learning environments. (Bill Mitchell's account of the architect/designer Frank Gehry's pioneering use of tightly-coupled design and manufacturing tools is a useful evocation of what might be done in the field of educational design here—see, for example, Mitchell, 2004).

To summarise, the relationships between educational design/pedagogical patterns (on the one hand) and work on learning design and learning objects (on the other) depend quite strongly on technologies of representation. The current state of play would suggest that patterns sit comfortably in the world of printed text and have a strong communicative and educative function. Learning design is firmly ensconced in the digital world and is better suited to the implementation of design ideas than their formation by technically unsophisticated teacher-designers. Patterns help with understanding; learning design helps with performance. However, we would argue that this balance depends upon the sophistication and ease-of-use of design technologies available to the teacher. It is not set in stone.

DESIGN PATTERNS FOR NETWORKED LEARNING

In this section, we try to give a flavour of some of our own recent work on hatching design patterns for networked learning through empirical research that involves interviews with experienced teacher-designers as well as with students. ‘Networked learning’ is our preferred term for online collaborative learning (Steeples & Jones, 2002). Some early work in this area is reported in Goodyear, Avgeriou, Baggetun, Bartoluzzi, Retalis, Ronteltap, et al. (2004). We summarise two lines of research: Goodyear’s work with Lally and de Laat, based heavily on de Laat’s PhD thesis (de Laat, 2006) and Yang’s PhD research that is attempting to combine design patterns with insights from systemic functional linguistics (Yang & Goodyear, 2006).

A FRAMEWORK FOR DESIGN PATTERNS FOR NETWORKED LEARNING

Tables 2 to 5 provide an overview of 48 design patterns derived from de Laat’s PhD interview and analysis work (Goodyear, de Laat, & Lally, 2006). The patterns are organised into four phases (start up; beginning; middle; end). The left hand column of each table describes key concerns in each phase. The middle and right hand columns summarise the solution part of relevant design patterns aimed at the group of students and the teacher.

The start-up phase focuses on what might be called induction tasks (familiarisation and community building) that have emerged from the literature and from student and teacher interviews as providing vital foundations for collaborative online working.

The beginning phase is the section of a networked learning course where the collaborative group tasks (such as a group project) gets seriously underway. The emphasis shifts from group formation to group production work. As the group develops its own life and momentum, tutors begin to reduce the number of ways in which they intervene, pulling back to a core monitoring role.

The middle phase is where most of the group project work get done. The teacher plays a reactive role, but the person best placed to get a sense of individual and group activity will also intervene with feedback and guidance about group progress.

The ending phase (Table 5) emphasises the importance of learning through reflection on the process and products of group working. Too often, individual students are so relieved to have finished the assigned group project that they hurriedly move on to the next challenge, losing valuable opportunities for learning. For the teacher, the ending phase is also a time to close the design

Table 2. Patterns for the start up phase (based on information in Goodyear et al., 2006)

Phase	Group activities	Teacher activities
Start-up phase		
Initial networked learning design		Use previous pedagogical framework and share with other teachers on this (or similar) course
Familiarisation with networked learning environment	Organise premeetings and share experiences	Provide an introduction to the open-learning space
	Get to know each other. Provide background information about work, interests, and reason for signing up for this project	Be an active participant and address changing relationship
Familiarisation with pedagogical models	Discuss what collaborative learning means within the group	Explain the approach to collaborative learning and attitudes towards knowledge construction
		Discuss what the role of the teacher is during this process
		Raise awareness of regulating both task and group processes
	Negotiate individual learning preferences with learning goals and group capability to learn	
Community building	Develop rules of engagement and etiquette	Participate in these conversations, set the right tone, and contribute to the development of a sense of community
	Build trust and discuss how to provide support and guidance to each other	Set the stages in the beginning, provide guidance and reassurance to the group
	Discuss intended level of participation and availability during the project	Participate in this and discuss presence and availability during the project
	Build up a collective understanding of each other's desires, commitment, and work (or learning) preferences	

loop—doing what can be done to see that future course design (etc.) is informed by these recent pedagogical experiences.

DESIGN PATTERNS AND SYSTEMIC FUNCTIONAL LINGUISTICS

Yang's PhD research examines text functions in network learning. Her research explores the use of

Table 3. Patterns for the beginning phase (based on information in Goodyear et al., 2006)

Phase	**Group activities**	**Teacher activities**
Beginning phase		
Conceptualise collaborative project	Negotiate what the project could be about and which problems it will address	Provide active guidance and facilitate group processes to make sure everybody has a voice in establishing their project
Task-focused communication	Create personal and professional focus to increase personalisation, identification, and recognition of the issues that need to be addressed in the project	Participate in developing a working method and learning agenda
	Identify and address overlap and gaps between individual and collective learning processes and outcomes	
Socially centred communication	Create a healthy learning climate and think about individual and shared responsibilities	
Develop a learning agenda based on personalising the group structure and task ownership	Based on previously discussed desired ways of working, develop a structure that is true to your own situation and connected with the content of your task	Open up these conversations and use the pedagogical framework to induct students in this process
	Develop an action plan and set up deadlines and milestones to be met throughout the project	
	Develop roles and strategies to structure the collaborative learning	Stimulate the group to make roles and strategies explicit
Develop a group rhythm	Develop a group rhythm based on previously discussed levels of participation and duration of the task	Discuss your presence
Inter-metacognitive knowledge and skill	Gradually develop inter-metacognitive skills	Gradually hand over control to the group and withdraw

Systemic Functional Linguistics (SFL) and pattern languages in educational design. SFL provides a theoretical tool for analysing how teachers and students use (online) texts in networked learning. Through construction of and interaction with texts, teachers and students develop their capacities to share new ideas, concepts, and values in their learning community. The quality of texts being used by teachers and students plays an important role in the quality of teaching and learning. We

Table 4. Patterns for the middle phase (based on information in Goodyear et al., 2006)

Phase	**Group activities**	**Teacher activities**
Middle phase		
		Close monitoring (both content and process)
Strong focus on the content of the task and ongoing facilitation of group processes	Actively work on the task	
Ongoing reflection on group functioning and dynamics	Take control of regulating and managing your project	Hand over control to the group and leave it with them as far as possible
	Make necessary adjustments based on emerging roles, levels of participation, and work needed during this phase	Provide access to feedback material on how the group is working
	Monitor and adjust overlap and gaps between individual and collective learning processes and outcomes	Monitor and adjust overlap and gaps between individual and collective learning processes and outcomes
Community spirit and trust building	Facilitate each other and maintain a healthy learning climate in the group	
	Believe in the quality of the work	Provide scaffolding or guidance when needed

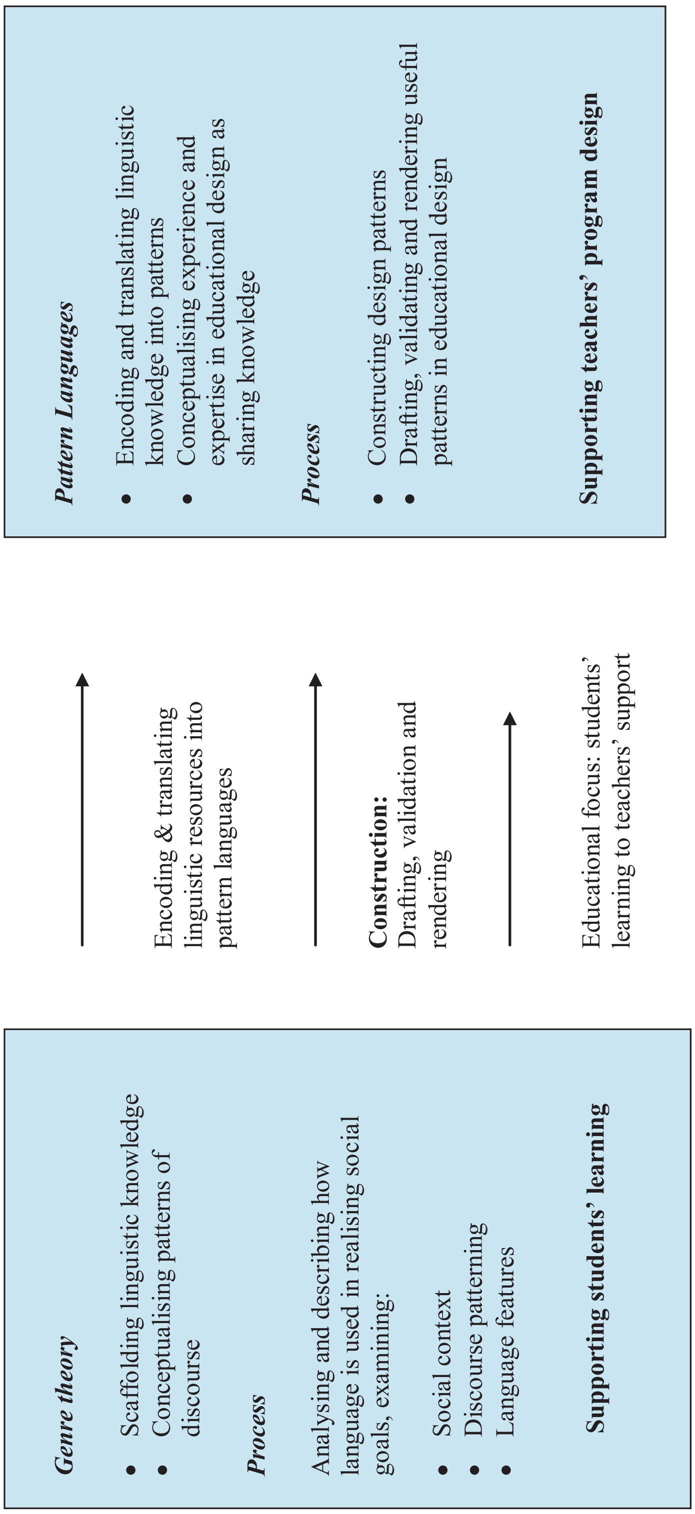
Table 5. Patterns for the ending phase (based on information in Goodyear et al., 2006)

Phase	**Group activities**	**Teacher activities**
Ending phase		
Gradual shift towards reflection on the work done	Start wrapping up the project	Provide guidelines, deadlines, and procedures for wrap-up
Reflect on the current group structure to facilitate and design	Revisit original structure to deal with emergent structures	
Reflection on the project	Assess individual and collective learning outcomes, using self and peer assessment reports	
		Update pedagogical framework

need ways of describing and analysing these texts in order to explain how they function.

SFL and genre theory primarily developed through the work of Halliday and Martin (e.g., Halliday, 1974; Martin, 1992). SFL is concerned with explaining language in terms of what people do with it. Halliday identified three different *types of meaning* (or 'metafunctions') which can

Figure 3. Genres to pattern languages



be found in all human languages: interpersonal, ideational, and textual. Martin's work on register and genre takes each of these three metafunctions as a variable, which he calls respectively *tenor* (the power and solidarity of relations between speakers; interpersonal meaning); *field* (topic or ideational meaning), and *mode* (the role of language; textual meaning). The idea of genre then allows one to identify and group together the grammatical choices that constitute a recognisable linguistic practice within a culture—to label a typical way of getting something done within that culture.

Yang's research uses SFL and genre theory to analyse some texts selected from networked learning courses. Her study explains and illustrates how different text types are used to fulfill different social functions; how different text types are constructed differently in their schematic structure; and how different text types deploy different linguistic features. The study aims to capture the linguistic resources and knowledge in a repository of educational design patterns. The idea is that these design patterns can be reused and extended through innovative developments in design for networked learning. Also, new teachers can use these patterns as a source of guidance for developing resources and strategies to improve their teaching. The research process falls into three main phases as illustrated in Figure 3.

Some preliminary results from this work can be found in Yang and Goodyear (2004, 2006). Here we focus on one more detailed example of what can be achieved. Students who are new to networked learning do not usually find it easy to adopt appropriate ways of speaking/writing in discussions with their fellow students and the teaching staff. This is apparent from interviews with experienced networked learning teachers as well as from the literature (de Laat, 2006). It is

Figure 4. Hedging design pattern

Hedging

This pattern describes a way of using language in online texts produced by a FACILITATOR and/or a DISCUSSION GROUP. It refers to the use of language which avoids strong commitment to a position in a discussion. It can help avoid premature closure of a discussion, and/or the marginalisation of some members of the discussion group.

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The language used in online discussion needs to serve multiple purposes, including the maintenance of good working relationships and the exploration and clarification of ideas. A sharply-worded analysis of a strongly-held position may be good for conceptual clarity but it may not encourage others to share their views. Conversely, too much time spent on 'group-maintenance' functions can be frustrating for some, and may slow down the collaborative exploration and improvement of ideas.

Hardy et al (1994) provided some very convincing data and arguments about the ways in which online discussions came to a premature end. They associated these with the gender of the speakers/writers. It is clear from their research that people vary in the extent to which they will tolerate, or respond badly to, forcefully-expressed opinions. An underpinning value in networked learning is that all students should feel their opinions will be treated with respect. Therefore the language used should be of a kind that will encourage all participants to engage in the discussion, respecting feelings but also using sufficient precision to allow the collaborative improvement of ideas (Bereiter, 2002).

'Hedging' connotes a way of using language that allows clear expression of key ideas while avoiding the impression that the writer is adopting a position of unassailable authority. It tends to use phrases such as 'it may be the case that…', or 'it's possible that…', or 'I'm not sure about this, but I think that…'. This conditional phrasing undermines the appearance of authority while still allowing the writer to be crystal clear in what they actually want to say about the matter under discussion. Language use is infectious – if some people regularly use hedging, it's likely to spread.

Therefore, in the model texts you provide for students, and in your own contributions to the online discussion, make appropriate use of hedging as a way of maintaining group solidarity, including everyone, and advancing the discussion.

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useful to provide some examples of appropriate kinds of writing. However, the selection and/or crafting of appropriate examples is time-consuming and difficult. The ideas of genre and register prove to be quite powerful tools in selecting and/or crafting, and explaining, appropriate texts.

For example, Yang's research has noted the careful, though not necessarily conscious, use of what she calls 'hedging' in some networked learning texts. Hedging refers to the avoidance of commitment in texts and is marked by phrases such as 'it may be…' or 'it is possible that….' Hedging involves interpersonal meaning (it avoids the inference that the speaker is adopting a position of superiority, authority or power). But it does this in the background, without undermining ideational and textual meaning. It can carry a discussion forward while minimising the risks of premature closure (Hardy, Hodgson, & McConnell, 1994). An implication is that some of the model texts provided for students should make appropriate use of hedging, and that this might also be carried over into the teacher's ongoing use of language during a networked learning course.

FUTURE TRENDS

Producing good patterns is hard, and there are very few success stories to date (Garzotto & Retalis, this volume; Voigt & Swatman, 2006). Fincher and Utting (2002) note that the creation of architectural design patterns by Alexander and his team, and software engineering patterns in the Gamma et al. collection entailed several years of demanding effort by people working closely together. Much of what has been published about patterns in the educational design area is still scratching the surface—at the level of expositions of the approach rather than convincing collections of workable ideas. An exception might be the work of Michael Derntl and colleagues at the University of Vienna (see, e.g., Derntl, 2004) on person-centred e-learning pattern repositories, though it is rather early to be able to tell how widely this work will be taken up.

Another issue of possible concern—sometimes mentioned in the patterns communities—is that Alexander's work has had less influence in architecture than it has had in software engineering. Opinions vary on this matter. For some, Alexander's architectural work is seen as too impractical or romantic. Others point to its hard mathematical edge and its deep philosophical roots, and they also note the extraordinary scope of his more recent writing on the nature of order, touching on fields from biology to poetry (Alexander, 2006). Central to his recent writing is a re-examination of conceptions of life and of the organic: what it means to say something is alive. There are strong parallels with notions of emergence and complexity (Rohse & Anderson, 2006). In short, the challenge is to replace mechanistic ways of seeing and acting in the world with ways that are more organic, to understand process rather than (just) optimise product.

From this broader perspective, we see the following as promising avenues for exploration and development:

1. A shift of emphasis from the individual learning mind to learning in and by communities means that we need more powerful (subtle and insightful) ways of analysing and describing learning processes and their ecologies. We also need to free up our thinking about the role of students as codesigners of their learning environments (Fischer & Giaccardi, 2006; Rohse & Anderson, 2006).
2. In thinking about the interactions between learning activity and the physical/digital environment in which it is set, we need a better understanding of the extent to which that environment reflects and reproduces dehumanised, mechanistic, and alienated ways of learning. A range of analytic paths are available here. We follow Tom Erickson

(2000) in recommending Randolph Hester's work on participatory community design. Hester's careful discovery of what were 'sacred places' for the community with which he worked stands in marked contrast to the romantic and rationalistic tendencies that polarise discussion about technology, place, and human activity.

3. These explorations need to take place at micro *and* macrolevels, uncovering and reanalysing more of the important details of learning as well as building a more robust sense of contexts. Such exploration entails empirical and conceptual work, but also design and development work—testing our understanding through the production and evaluation of new tools and methods (Clancey, 1997). Under this umbrella, further work on and with patterns continues to make sense, as does the articulation of such work with other investigations in the field of educational design.

CONCLUSION

In this chapter, we have tried to give a flavour of recent work on the production and evaluation of educational design patterns and pattern languages, placing this in the wider world of thinking about learning and educational design and complementing the exploration of this topic in Garzotto & Retalis. The sense that one makes of the patterns-based approach depends heavily on where one sees the hard problems of educational design, but also the problems on which some progress might be possible. We reiterate the view that this is a complex and important area, in which progress demands work at micro and macro levels. It makes sense to hatch and reflect on patterns. It also makes sense to worry away at the conceptual and moral foundations on which the prevailing approaches to educational design and its technologies are built. In our view, progress in the field cannot be measured simply by efficiency gains in established kinds of educational design task. Better design performance is only worthwhile if the resulting designs and their underpinning conceptions of learning fit the emerging needs of the autonomous lifelong learner. It may well turn out that approaches to supporting educational design that deal with understanding *and* performance are what we need to help teachers as designers question prevailing practices and transform the nature of educational experience.

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KEY TERMS

Design Pattern: A way of representing a contextualized solution to a design problem with sufficient precision and explanation that it is an effective guide to action, but allowing scope for creative adaptation to specific needs.

Educational Design: A representation of how to support learning in a particular case; educational design is the process of constructing such representations.

Networked Learning: A form of collaborative online learning where technology is used to help learners connect (with each other, with their teachers, with valued learning resources).

Pattern Language: A network of design patterns, where each pattern helps solve a part of the overall design problem addressed by the pattern language.

Systemic Functional Linguistics (SFL): An approach to understanding language that emphasizes its social function: focusing on the exchange of meanings within a social context.