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Using pattern languages to mediate theory–praxis conversations in design for networked learning

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Educational design for networked learning is becoming more complex but also more inclusive, with teachers and learners playing more active roles in the design of tasks and of the learning environment. This paper connects emerging research on the use of design patterns and pattern languages with a conception of educational design as a conversation between theory and praxis. We illustrate the argument by drawing on recent empirical research and literature reviews from the field of networked learning.

Introduction

A starting point for the argument presented in this article is that educational design is becoming a more complex and a more inclusive area of activity, where once it would have be characterised as a specialist occupation involving some tried and tested procedures (Wilson, 1997; Reiser, 2002). As conceptions of learning become more sophisticated and diverse, and as learners and teachers become more proactive in shaping the learning environment, so educational design becomes a more distributed activity—one that involves the generation of new roles, concepts, tools and methods (Spector & Anderson, 2000). We argue that the increasing complexity of learning situations will require *and* help people to become more design-savvy. Sometimes this will mean participating in design. At other times it will mean recognising good design and making good choices.

Some of the sources of increased complexity are visible now. We are asking learners to become more autonomous and to exercise choice over the broad shape and fine details of what, why, how, where and when they learn (Simons *et al.*, 2000). This includes choice about whether they learn with others. In some areas of formal

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education, some learners resist parts of this new burden of responsibility. In other learning situations, learners insist upon greater control. Whether for sound pedagogical reasons or in response to consumer demand, shifts to greater learner control add complexity to educational design. Couple this with accelerating technological change, especially the growth of smarter and more ubiquitous personal, mobile and social technologies, and educational design looks even more complex. It *has to be* a distributed problem: not one amenable to top-down solution.

Carl Bereiter (2002) has argued that education is beginning to shift from folk conceptions to more scientific conceptions of mind, knowledge and coming to know. Conversations about learning, teaching and educational design—involving learners, teachers, designers and researchers—are necessary to, and necessitated by, this shift.

The main purpose of this article is to show how such conversations can be supported by an educational design paradigm based on the use of design patterns and pattern languages. This design paradigm is unashamedly democratic—its purpose is to help people understand and take more control in educational design. The structure of the article is as follows. First, we explain what we mean by theory–praxis conversations, and why we think these are important. Second, we introduce the idea of design patterns and pattern languages. (Our debts are to Lawrence Stenhouse and Christopher Alexander, respectively.) Third, we give a worked example of how empirical research on networked learning connects with the development of a pattern language for networked learning. Fourth, we show how such a pattern language can be a resource for, and enhanced by, theory–praxis conversations. We conclude with some observations about promising lines for further research and development work.

Most of our work on this theme has been in the domain of networked learning—although the implications of our argument probably run more widely than this. By networked learning we mean an educational context in which information and communication technologies are used to promote collaborative and cooperative connections—between one learner and other learners; between learners and teachers; between a learning community and its learning resources—so that participants can extend and develop their understanding and capabilities in ways that are important to them, and over which they have significant control (Banks *et al.*, 2003, p. 1).

Design for networked learning involves a number of challenges to create and support powerful learning contexts in which teachers and learners can interact constructively. In part, we think these challenges can be addressed through theory–praxis conversations. In such 'conversations', pedagogical and learning theories interact with insights from design praxis leading to the development of richer theory and providing a better basis for designing networked learning.

Theory–praxis conversations

We use the term 'praxis' to mean actions that result from the deliberate application of theory or are entailed by a particular theoretical structure (de Laat & Lally, 2003). The idea of a theory–praxis conversation or interaction was developed by Lawrence Stenhouse (see, for example, Stenhouse, 1983). He argued that the development of

a theoretical understanding of educational action and doing educational research into the practical problems of education are inseparable. If educational research focuses on the problems that arise in trying to realise a form of educational praxis, then it will pose questions both about which actions in the context are constitutive of such praxis and about the educational criteria employed in deciding this. To summarise, educational research, on Stenhouse's account, is a process that involves the joint development of educational praxis and theory in interaction

To push the conversational metaphor a little further, theory–praxis conversations require some shared language and common ground—without which it is difficult to see how mutual understanding and influence can be achieved. Such shared language and common ground can be hard to find. Practitioner experience gets represented in 'war stories', case studies, vignettes or teaching tips—which are not easy to connect to theory. Meanwhile research produces evidence and theory that can be hard to connect back to the particular, situated concerns of a practitioner. Matters are even worse when we consider learners who have little or no appetite for educational theory.

What we need are ways of bridging between theory and praxis: ways of mediating the conversation. To this end, we introduce the idea of design patterns and pattern languages (Goodyear *et al.*, 2004; Goodyear, 2005a).

Design patterns and pattern languages

Design patterns and pattern languages originate in Christopher Alexander's ideas about architecture (Alexander *et al.*, 1977; Alexander, 1979). Part of Alexander's intention was to democratise architecture by offering a set of conceptual resources that ordinary people could use in (re)shaping their environment. His work provides a principled, structured but flexible resource for vernacular design. The approach resolves a tension between rigour and prescriptiveness—offering useful guidance without constraining creativity. It helps foreground key design issues that might otherwise be missed. It redistributes design power from technical specialists to those who inhabit (educational) spaces—in our case, teachers and learners.

A pattern is a solution to a recurrent problem in a context. In Alexander's own words, 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, p. x)

Context is important in helping constrain and communicate the nature of both problem and solution. Describing the context for the problem and its solution avoids over-generalisation. In addition, patterns should also teach. They should be written in such a way that they help the reader understand enough about a problem and solution that they can adapt the problem description and solution to meet their own needs. The rationale for the pattern helps with this teaching or explanatory function. Ideally, the name of the pattern should crystallise a valued element of design experience and help relate it to other design elements such that we can create and use a

pattern language. The use of patterns, then, can be seen as a way of bridging between philosophy, values, theory, empirical evidence and experience (on the one hand), and the practical problems of design.

The textual representations of Alexander's design patterns have the structure shown in Figure 1. An example situated in the area of educational design for networked learning is given in Figure 2.

Some of the meaning of a design pattern comes from its location in a network of patterns, otherwise known as a pattern language. For example, it would be possible to create a pattern language to capture key elements of educational design for learning through online discussion. At a high level, this might include patterns for, say, debates, buzz-groups, seminars and tutorials. Lower level patterns capture the key tasks implicated in these forms of discussion-based activity, as well as the tools and resources needed for their efficient conduct.

Part of our current work as designer/teachers in networked learning involves the use of software elements that map onto some of these patterns. For instance, Goodyear and Reimann's teaching in the Sydney LearnLab environment provides students with the freedom to set up new discussion fora, wikis and document repositories, and to select other collaboration tools, as and when they decide they need them (Ullman *et al.*, 2005). This can be done by individuals, or by student project teams, as well as by the teacher. However, students benefit from having some guidance about which

A picture (showing an archetypal example of the pattern)
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.

A diagrammatic representation of the solution

♦ ♦ ♦

(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 1. Typical structure of an Alexandrian design pattern (after Alexander *et al.*, 1977, pp. x–xi)

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.

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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 ëlistenedí to by all other members of the group.

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

Pilkington and 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.

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

Figure 2. Design pattern for discussion group (Goodyear, 2005a)

tools and organisational forms are useful for which kinds of purposes, and this is exactly the kind of problem with which design patterns can help (see, for example, Goodyear, 2000).

Our recent empirical work in this area takes a number of complementary forms, including: elicitation of pattern-informing evidence and experiential knowledge from networked learning practitioners, in intensive workshops; similar elicitation processes and feedback on prototype design patterns, in semi-structured interviews and focus groups; and 'pattern-hatching' events at conferences and within the meetings of project teams. These are supplemented by analyses of case studies drawn from networked learning courses as well as syntheses of theory and evidence from the research literature (Goodyear *et al.*, 2004; Goodyear, 2005a, b).

It is on these occasions that pattern languages can mediate theory–praxis conversations through connecting contextualised but reoccurring problems with validated empirical research.

From research to patterns

In the previous section a pattern for discussion groups was presented. This pattern addressed a known problem in everyday networked learning practice about how to offer a good structure for a discussion group. In this section, it is our aim to draw on a body of empirical research to connect with this pattern and contribute to the conversation within this pattern language on networked learning environments. The problem about structuring discussion groups as expressed in the design pattern presented in Figure 2 is a common issue discussed in many studies on networked learning.

Reviews of the networked learning literature (for example, de Laat, 2006) indicate that students benefit from a proper introduction to, and familiarisation with, this way of working and learning together. Taking part in an online discussion, for example, requires particular attitudes and competencies, and it takes time for students to develop these and/or bring them to bear on their learning. Paradoxically, students usually need to be explicitly informed about, and socialised into, community-based constructivist learning. They have to (re)learn to become active learners, and need time to develop confidence to act as constructive learners, and exercise autonomy. It is clear that providing a community forum by itself is not enough. A role for the teacher-designer includes creating 'ground conditions' within the course design: to create the circumstances in which a sense of community can develop, and where students become aware that there are complex group dynamics involved in learning together. Students also need to learn to act as a community, where they take on active responsibility for educational processes as well as managing cohesion, well-being, trust, emotion, spirit and motivation in the group.

During earlier research into tutoring and learning processes (de Laat & Lally, 2003, 2004; de Laat *et al.*, in press) we used a multi-method approach, which provides a rich description of the complexity of networked learning settings. This multi-method approach was developed to address the multi-faceted complexity of the processes

involved when tutoring and learning in networked learning communities. In this approach, the focus was on triangulating data on social network analysis (who is talking to whom?), content analysis (what are they talking about?) and contextual analysis (why are they talking in such a way?). This method was used repeatedly within a couple of case studies not only to explore how tutoring and learning processes take place within networked learning communities, but also how these processes evolve over time. Through this timeline dimension, certain key factors with respect to the main problem in the previously discussed pattern came to light:

- *Learning together*. Through content and social network analysis we have seen that the students are actively engaged in collaborative learning activities. They debate ideas and problems among themselves, contribute new information, make summaries, reflect on content, as well as share 'social' experiences that are or are not directly related to the task.
- *Tutoring together*. Group regulation and coordination is something all the participants are concerned with. They motivate each other, develop an open learning climate, and encourage each other to contribute, think and co-design course activities. Our empirical findings show elements of developing a learning agenda together, taking active charge and control over their learning activities and engaging in processes of helping out, supporting and facilitating each other. They develop social relationships in order to sustain their work on the learning task.
- *Personal learning goals*. At the same time these collaborative learning activities tend to be driven by personal interest and learning agendas. Students try to put forward their own interests (or stimulate ideas of others who happen to advocate their interests) when the learning task is being conceptualised, and during the project the motivation to regulate and coordinate group processes is often rooted in their personal desire to get the task finished. Comments from fellow students are often valued as a way to achieve one's personal goals.
- *Changes over time*. In our studies, tutoring and learning activity is highest during the middle phase of activities, where the focus is also drawn towards working on the task and facilitation of group processes. In the beginning phase they show elements of working on the task and setting up a group structure to support this (facilitated by the teacher). During the closing phase there is a relative increase of reflection on the task and a focus on facilitation and instructional design to coordinate the final phase of their collaboration. The teacher is mostly engaged in this as well.
- *Changing teacher–student relationship*. The students do not just rely on guidance from the teacher, but value and provide support and guidance to each other. The teachers, during the courses, try to set the stage in the beginning, and provide guidance and reassurance to the group to support the group in developing their collaborative project. But at the same time their position is somewhat 'levelled' with that of the students, with a view to creating an open learning environment where everybody can participate in the development and design of their collaborative project. The teachers in the case studies act both as learners and tutors, although their main concern is to guide and facilitate the group's learning.

- *Group structure*. We found that students were developing roles and strategies to structure their collaborative learning. Over time we have seen that these roles are not necessarily occupied by the same people. Each phase has its own configuration of people moving into and out of the central positions. Through participation they learn from each other's strategies and styles, and use this to facilitate their own learning goals as well as the goals of the group.

These key factors, when connected to the problem presented in the design pattern, can be used to develop a set of guidelines for a community-centred approach to networked learning (de Laat, 2006) and can result in the development of a set of community-centred design patterns, to help structures emerge and be negotiated, in an ongoing process, between the members.

There is not room here to give the full text of the design patterns. Instead, we offer the text from the *solution part* of each pattern (which is the heart of a pattern, see Figure 1). The patterns are structured in relation to four key phases of a networked learning programme (start-up, beginning, middle, end) (Table 1). The text in the left-hand column orients the reader to the focal purpose of the pattern. Solution texts are given in the middle and right-hand columns. In this table, we have attempted to distinguish between solutions that are oriented primarily to the learner group (middle column) and those that are oriented primarily towards the teaching staff (right-hand column). In actuality, there can be significant sharing of this work between learner groups and teaching staff.

Patterns in the theory–praxis conversation

Moments for reflection and re-design

Asynchronous networked learning courses offer opportunities ('moments') for evidence-informed decision-making in relation to teaching, learning and design. This is much less the case with conventional (synchronous) face-to-face teaching, where the data for analysis is not usually available by default, as it would be in a virtual learning environment (VLE), and where time is more pressing.

These moments for reflection and decision-making occur at a number of scale levels. In addition to the 'obvious' design phase (pre-course), there is also the period between the end of a course and the next time it is run. It also makes sense to encourage the use of some planned moments for reflection and re-design during the course (e.g. at two or three key points in the course; perhaps spending half a day reflecting on data and experiences from the previous three or four weeks, and planning the next three or four weeks). Also, at the micro-level, it makes sense to encourage taking a more 'design-savvy' approach to online teaching, rather than (say) responding to each and every student action.

When applying a community-centred approach to networked learning, as in the example presented in the previous section, where the students have a shared responsibility and control over the networked learning setting, these moments of reflection and re-design do not exclusively belong to the domain of the teacher, but they are in

Table 1. Summary of patterns (based on de Laat, 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 pre-meetings and share experiences	Provide an introduction to the open-learning space
	Get to know each other. Provide background information about your work, your interests and why you signed 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
	Negotiate individual learning preferences with learning goals and group capability to learn	Raise awareness of regulating both task and group processes
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 your presence and availability during the project
	Build up a collective understanding of each others desires, commitment and work (or learning) preferences	
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	

Table 1. *Continued*

Phase	Group activities	Teacher activities
Socially centred communication	Create a healthy learning climate and think about your 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 rhythm based on 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
Middle phase		
Strong focus on the content and ongoing facilitation of group processes	Actively work on the task	Close monitoring (both content and process)
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	Monitor and adjust overlap and gaps between individual and collective learning processes
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
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	Update pedagogical framework
Reflection on the project	Assess individual and collective learning outcomes, using self and peer assessment reports	

fact stretched over the entire networked learning community. In this approach also the students play an active part in designing networked learning. When building in re-occurring moments of reflecting during the course, all the participants are invited to think more strategically about their performance and make plans on how to move forward.

Whatever the level of re-design, we advocate an approach in which the work at these moments is informed by a combination of evidence from data analysis (as outlined earlier), and theory. The strategies and activities arising from these re-design moments can be embodied in design patterns (and other representations of various kinds). This further strengthens an evidence-base for design.

Sharing evidence and design patterns within extensive networked learning communities

We think that one of the important features of design patterns is that they represent an 'actionable locus': a place where the evidence from data analysis, theorising, previous praxis and practical strategies come together in a form that can be used in further, real praxis. Such patterns can also be an accessible, readily understandable and 'standardised' form in which to share 'good' praxis as it evolves in cycles of momentary refection, theorising and analysis (written in a pattern language). This evolution results from the 'ongoing conversation' between theory and praxis. Communities of practice (e.g. networked learning teachers and researchers in higher education) might do well to draw on design patterns as an evolving knowledge-base. This would require some consensus about the format of patterns. Contextual details of pattern usage and update would also need to be appended. The knowledge-base could include the actual design pattern as well as the evidence, analysis, theorising and experience from praxis upon which it was based, so that community members can both use it and engage with it in a more extended, deeper way. These features help teachers and others use their own ethical judgement in implementing design patterns, and lessen the risk of teachers becoming technicians who simply draw upon an expert system, the moral and conceptual basis of which is opaque to them. The community location of a design pattern evidence-base becomes a powerful way of holding expertise within that community.

Further research and concluding comments

The most urgent task is to provide high-quality examples of design patterns, together with the analysis, praxis expertise, contextual data and theorising (upon which they are based) in an exchangeable format. These need to be embedded in illuminative case studies showing evolution and use in a range of contexts. Beyond that, we need to attend to the structures, tools and 'economy' of knowledge exchange among networked learning practitioners and researchers. These practical tasks raise their own research questions about how best to support the collaborative construction of knowledge within distributed networked communities and map out an agenda for further conversations between theory and praxis over the coming years.

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