



Design expertise for e-learning centres



Design patterns and how to produce them



About this booklet

This booklet introduces the E-LEN approach to designing effective e-learning environments by using design patterns to guide the design process. It has been produced by the E-LEN project team, a network of European institutions with experience in e-learning who together share and develop information and design patterns regarding e-learning.

Is it for you?

This booklet is written for people who are professionally involved in e-learning, such as the staff of e-learning centres. By 'e-learning centre', we mean a unit within a larger organisation (such as a university or a company) that has the role of helping the members of the organisation to create e-learning opportunities (courses, resources, learning communities, tools, etc.).

Structure

There are three parts to this booklet:

- Part I provides background information about design patterns, their origins and how and why we want to use them for e-learning.
- Part II provides material for use when running or participating within a workshop that aims to develop design patterns for e-learning.
- Part III provides notes and references.



Acknowledgements

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Part I: Background information

In this part of this booklet you will find background information about design patterns, their origins and how and why we want to use them for e-learning.

What are design patterns?

An introduction to patterns

Design patterns originate in the work of the architect Christopher Alexander in the late 1970s. In his three books: *The Timeless Way of Building*, *A Pattern Language*, and *The Oregon Experiment*², Alexander set out to reconceptualize approaches to architecture and urban design. Motivated by a conviction that many of the forces shaping modern life are damaging to our wellbeing, he looked to counteract these tendencies by seeking deeper and recurring patterns in human activity and in the physical environment within which such activity is set. Alexander sought to articulate these patterns in order to equip anyone who wished to improve their physical environment (home, street, neighbourhood) with a set of useful concepts and tools.

Alexander's definition of a pattern is that it:

“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”³

Design patterns provide a structure for integrating the analysis and solution of a problem, in a way that is sensitive to context and informed by theory and evidence. A pattern suggests, rather than prescribes, a solution. Solutions are intentionally incomplete: they offer guidance but require embellishment.

Here is an example of a Alexandrian pattern:



92 Bus stop

... within a town whose public transportation is based on MINIBUSES (20), genuinely able to serve people, almost door to door, for a low price, and very fast, there need to be bus stops within a few hundred feet of every house and workplace. This pattern gives the form of the bus stops.

* * *

Bus stops must be easy to recognise, and pleasant, with enough activity around them to make people comfortable and safe.

Bus stops are often dreary because they are set down independently, with very little thought given to the experience of waiting there, to the relationship between the bus stop and its surroundings. They are places to stand idly, perhaps anxiously, waiting for the bus, always watching for the bus. It is a shabby experience; nothing that would encourage people to use public transportation.

The secret lies in the web of relationships that are present in the tiny system around the bus stop. If they knit together, and reinforce each other, adding choice and shape to the experience, the system is a good one: but the relationships that make up such a system are extremely subtle. For example, a system as simple as a traffic light, a curb, and street corner can be enhanced by viewing it as a distinct node of public life: people wait for the light to change, their eyes wander, perhaps they are not in such a hurry. Place a newsstand and a flower wagon at the corner and the experience becomes more coherent.

The curb and the light, the paperstand and the flowers, the awning over the shop on the corner, the change in people's pockets – all this forms a web of mutually sustaining relationships.

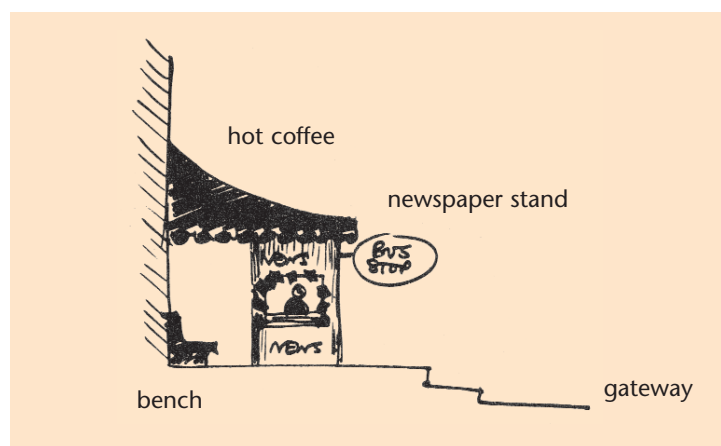
The possibilities for each bus stop to become part of such a web are different – in some cases it will be right to make a system that will draw people into a private reverie – an old tree; another time one that will do the opposite – give shape to the social possibilities – a coffee stand, a canvas roof, a decent place to sit for people who are not waiting for the bus.



Two bus stops

Therefore:

Build bus stops so that they form tiny centers of public life. Build them as part of the gateways into neighborhoods, work communities, parts of town. Locate them so that they work together with several other activities, at least a newsstand, maps, outdoor shelter, seats, and in various combinations, corner groceries, smoke shops, coffee bar, tree places, special road crossings, public bathrooms, squares....



* * *

Make a full gateway to the neighborhood next to the bus stop, or place the bus stop where the best gateway is already – MAIN GATEWAY (53); treat the physical arrangement according to the patterns for PUBLIC OUTDOOR ROOM (69), PATH SHAPE (121), and A PLACE TO WAIT (150); provide a FOOD STAND (93); place the seats according to sun, wind protection, and view – SEAT SPOTS (241)...

There are 253 Alexandrian design patterns which together form a 'pattern language'.

"They create a coherent picture of an entire region, with the power to generate such regions in a million forms, with infinite variety in all the details."⁴

"A pattern language is really nothing more than a precise way of describing someone's experience of building. If a man has a great deal of experience of building houses, his language for houses is rich and complex; if he is a greenhorn, his language is naïve and simple. A poet of houses, a master builder, couldn't possibly work without his language – it would be as if he were a greenhorn."⁵

A small subset of the patterns can be sequenced together to make a pattern language for designing, for example, a porch on the front of a house. Different designers, on different occasions, would select different subsets of patterns and therefore use a different pattern language for each porch.

The elements and structure of a pattern

Many formats for design patterns have been developed over the years since Alexander first published his design patterns for the built environment. Although they vary in many ways, they all share some common minimum characteristics, namely:

- a name for the pattern
- a description of a problem
- the context
- the forces that play a role in coming to a solution
- the solution itself.

You can see how each of these four common elements appears in the examples presented below.

Example structure 1: Alexandrian patterns

Alexandrian patterns are constructed to the following format:

- 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 that are required to solve the stated problem in the stated context. It is 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 that are needed to complete and embellish it.

Example structure 2: Pedagogical Patterns by Joseph Bergin, Pace University

Bergin's pedagogical patterns are presented as part of the Pedagogical Patterns Project (www.pedagogicalpatterns.org). They follow the structure below:

- Name
- Thumbnail
- Audience/context
- Forces
- Solution
- Discussion/ consequences/ implementation
- Special resources
- Related patterns
- Example instances
- Contraindications
- References

Example structure 3: E-LEN patterns structure

The E-LEN design pattern structure was developed early in the project. We chose to use a very comprehensive structure to enable us to capture all relevant aspects of a design pattern. A detailed structure such as this can be helpful when writing patterns; however, fully mature patterns might best be communicated to others by adopting a simpler structure closer to Alexander's original.

Name:

Give a name that:

- covers the content (problem and solution)
- is meaningful and easy to remember
- gives rise to associations that are related to the described problem and solution.

Category:

Choose from: pedagogical/organizational/technical. Combinations are possible.

Abstract:

A short paragraph outlining key elements in the pattern.

Problem:

A detailed description of the problem.

Analysis:

An explanation of what makes this problem a problem, and why a solution is needed.

Example structure 3: E-LEN patterns structure (continued)

Known solutions:

This section should set out what constitutes a 'good practice' solution to the problem. It can be based on existing practice, or drawn from theory.

Research questions:

A description of any research questions that are still to be solved, and ideas about possible research settings and methods. Other remarks.

Context:

A description of the type of context the solution is applicable to.

Conditions:

A general description of critical success indicators/factors that influence use/implementation of the solution (e.g. required roles, type of resources), resources needed to solve the problem.

Discussion/consequences:

The consequences of use, implementation issues and other remarks.

References:

References for the pattern.

Related patterns:

Related design patterns and research patterns

Author(s):

Date:

Date of completion of the pattern.

Acknowledgements:

Acknowledge any other people or sources of help, information etc.

Patterns in software engineering and related fields

The idea of design patterns has been picked up and taken on a life of its own within the field of software engineering⁶. Researchers and practitioners are attracted to its potential for facilitating the capturing and sharing of aspects of software engineering expertise, and for representing successful models for the implementation of information systems.

More recently, the design patterns approach has been taken up in other technology-related fields, such as in design of hypermedia applications and in human-computer interaction (HCI). People in the software engineering community who teach about design patterns have also begun to explore the possible uses of pattern languages in the field of pedagogy⁷.

There is an important difference between the intentions behind Alexander's approach to design patterns and the intentions of most of the software engineering community. Software engineers typically make use of patterns to help them to organise the design space for the convenience of designers. *End users* of software are generally unaware of the specific techniques used in the software production. In contrast, Alexander's intention was to help people understand how their own homes, neighbourhoods and towns might be improved, in large part through their own action. Transferring his intentions to the use of ICT in education, one naturally thinks about how to empower the end users – how to help learners and teachers construct convivial learning environments.

“With hindsight, it seems extraordinary to us that Alexander’s work has initially had its most obvious influence on computing within the field of object oriented systems design. On the face of it, human–computer interaction design has more immediate correspondence with architecture; there is a visual aspect to interaction with the artefact, and the architectural metaphor is widely used in information system interfaces. In fact, Alexander did have a subtle, if not widely acknowledged influence on the development of contemporary HCI, through the writers of the *Apple Macintosh Interface Guidelines*. John Thomas has included Alexander’s work in the bibliography section on Environmental Design with the perceptive comment: ‘In spite of its practical orientation, the design principles—permeability, variety, legibility, robustness, visual appropriateness, richness, and personalization—can be easily transposed to the human interface domain’”⁸

Design patterns for e-learning

A definition of e-learning

We define e-learning as:

“the systematic use of networked multimedia computer technologies to

- empower learners,
- improve learning,
- connect learners to people and resources supportive of their needs, and to
- integrate learning with performance and individual with organisational goals.”⁹

Design problems in e-learning

Here is an example of the sort of problem practitioners might face when designing for effective learning:

A part-time postgraduate course for full-time teachers has been run by a university for the past four years. It is held two evenings a week for 26 weeks in the year. Two days a week the teacher-students must work a full day in school, then drive to the over-crowded campus of their city-centre university. They struggle to find a place to park. The refectories are shut. The classroom in which they meet is ill-furnished, badly lit, over-heated and laid out for lecturing rather than groupwork. Some teacher-students arrive late; others must leave early. Groupwork is interrupted, discussion is desultory. The lecturer – also tired – recommends some new reading at the end of the evening. The library is already closed. In any case, only one copy is available of each of the key texts and there are twenty people in the class. The teacher-students head home, with no time or energy to socialise or even learn each other’s names.

What should be done? The designer should question the need for face-to-face meetings when they take such a toll on the participants. What purposes should they serve? How

few will be enough? How should they be organised and resourced to achieve the narrower set of purposes? They must ask what the teacher-students need to learn. What should they be trying to learn from the lecturer? What from each other? What from reading? Experimenting? Reflecting? What time scales and resources are needed for each of these?

A value-laden approach

It is notable from the example of an Alexandrian pattern (the Bus Stop) given previously that his approach is explicitly value-laden: he has a clear vision of the type of city that he and his colleagues believe is a happy and healthy environment for people to live in. He wants to give people the tools they need to design for that vision. When you read the bleak picture of the postgraduate course described above it provides a counter-example of what we might aspire to for a happy and healthy educational environment. This sort of situation occurs repeatedly. It's not simply because of failings on the part of the lecturer, nor just a question of lack of money or resources. It results from a failure of effective design (or a lack of *any* deliberate design) of the learning environment that leaves important dimensions of the learning experience at the mercy of outside forces that are unsupportive of the desired learning outcomes.

The E-LEN network believes that e-learning patterns can and should be used to express educational values. We believe that e-learning should enable the enrichment of the learning paradigm in order to:

- (a) support open, flexible and learner-centred patterns of study;
- (b) provide new ways for learners to work collaboratively;
- (c) facilitate the development of communication and co-ordination skills, and
- (d) encourage the development of technological skills.

Aspects of good learning

Moreover, drawing on research in the learning sciences, we can identify a number of aspects of 'good learning' that ought to be taken into account in designing for e-learning from a constructive learning perspective:

- 1) *Learning is active*, i.e. the learner must carry out a variety of cognitive operations on new information, in order to make it personally meaningful.
- 2) *Learning is individual*, i.e. every learner builds their own knowledge in an idiosyncratic way, using past experience and existing knowledge to make sense of new information. All new information is dealt with in different ways by different learners.
- 3) *Learning is cumulative*, i.e. what a learner already knows will play a large part in determining what sense they can make of new information.
- 4) *Learning is self-regulated*, characterized by both (a) the learner's awareness of their own learning activity, and (b) the learner's ability to take action based on this reflection.
- 5) *Learning is goal-oriented*, i.e. clear goals are needed if learning is to be effective. These goals need to be explicit and to be understood by the learner.

- 6) *Learning is situated*, i.e. it depends heavily on the social and physical context (people, resources, tools) in which learning activity takes place.¹⁰
- 7) *Learning can be learned*.

We seek to identify e-learning patterns such that, where the pattern is evident in a course, a module, an online-environment, a seminar, etc, the learners and teachers feel empowered, free from avoidable stress, and happy.

It is important to note that e-learning patterns could be constructed by others with different educational values. We believe that it is better to be explicit about educational values than to attempt (or claim) to construct 'value-free' patterns.

What can be designed?

No matter how clear an e-learning designer may be in his or her goals, there is always an element of indirection in their activity. Whilst the designer may want the learners to achieve particular learning outcomes, they cannot design for those outcomes directly:

- Designers cannot (and should not) try to design the social relationships or the culture of a learning community; but they can (and should) design organisational forms that favour the emergence of convivial learning relationships.
- Designer's cannot expect to 'design' the learner's activity. They *can* design good learning tasks, but at best these are only resources that learners use in deciding what they will actually do. It would be a mistake (and, within a culture that values independent thinking, undesirable) to expect students to do just and only what we tell them to do. Students will approach any learning task in a way that is individual to them.
- Designers need to recognise that students will configure their own personal 'learnplace' to suit themselves in ways that are unpredictable (a kind of 'nesting'); the designer's role is to produce a supportive 'space' of well-designed tools and artefacts from which they can do this.

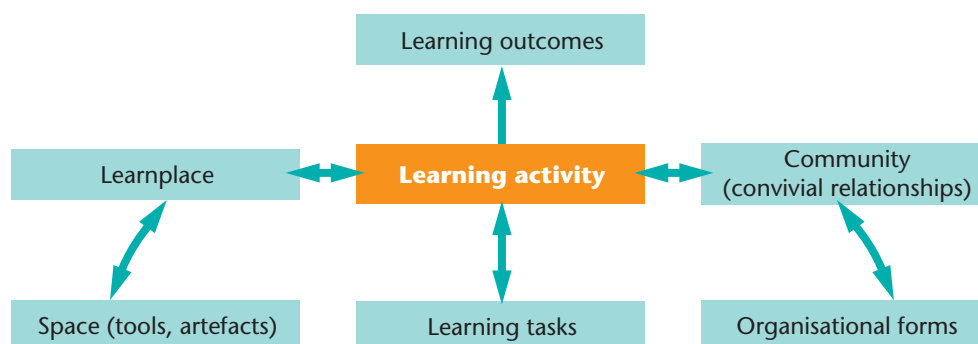


Figure 1: Designing for networked learning¹¹

The benefits of design patterns for e-learning

Designing for effective e-learning is a complex problem involving the design of learning tasks, learning resources and social spaces/organisational forms that will enable each learner to learn effectively. Practitioners (teachers and e-learning designers, particularly novice ones) need tools and methods to help them produce effective designs. Practitioners want guidance that is based on sound research about what will support effective e-learning; but advice that is too prescriptive, or based on a single model, doesn't help them to create innovative designs, suited to their particular context, that make the most of new and evolving technology.

Design patterns can help designers in bridging between theory, empirical evidence and experiences (on the one hand) and the practical problems of design.

There are five main virtues to adopting a patterns approach in e-learning design:

Virtue 1: Patterns are both empirical and normative, but not prescriptive

Patterns are abstractions based on empirical observation of recurring phenomena in the environment, but they are also normative: the text of pattern descriptions is meant to help you to act in a certain way.

Virtue 2: Patterns have an internal structure which is good for action-oriented evidence-based advice

A pattern's combination of problem description and 'solution' is powerful, if one gets the level of abstraction right. The problem must be recognisable, but not too specialised. The solution must be sound and contain useful guidance but not prescribe fine details. Abstraction helps in managing the complexity. Within a pattern there is a 'slot' for an account of the issues at stake; this can refer to research literature, but can also draw on rational analysis, social values, aesthetics, etc. There is scope for small-scale research to inform the analysis of a problem, without having to make grand claims about educational theory.

Virtue 3: There is expressive and normative power in the relations between patterns

Guidelines in educational design tend to run into problems of scope and scale, though some examples can be found of texts which try to lead you through a series of decisions at macro, meso and micro-scales.¹² The network nature of Alexander's pattern language helps with this problem. For instance, the idea of a pattern serving to embellish higher-level patterns, *and* work alongside patterns of the same scale level, *and* provide a context for lower-level patterns gives real power in (i) expressing educational ideas, problems and issues and (ii) in formulating comprehensible guidance.

Virtue 4: The pattern-based approach is inherently democratic and inclusive

Alexander's patterns are suffused with the language of political action and democratic, popular involvement in the processes of town planning and architecture. Patterns can be used to express educational values. Patterns should also be produced and made accessible in a way that allows learners to use the ideas in configuring their own learning environments. This has natural sympathies with ideas in open learning – with learners taking more control and more responsibility for their own learning. It also approaches this in a *social* way. This is a nice counterweight to the very powerful messages that we sometimes get from government or the e-learning industry about the value of individualised, on-demand, commodified learning.

Virtue 5: Patterns can help to enrich the language of educationalists

Many of those involved in creating resources and services for e-learning seem to have access only to an impoverished language for their discussions – one that restricts them to thinking about educational processes in a very rudimentary way. This is particularly problematic when multi-skilled, multi-disciplinary teams have to work together in order to create an e-learning environment. Specialists in teaching and pedagogy find it hard to understand the technical language of ICT specialists. ICT specialists are impatient with the jargon of educational theory and resort to their 'folk concepts' about learning and teaching. All of this tends to pull conceptions of learning and teaching down to the lowest common denominator.

Patterns can play an important role in helping technologists, teachers, educational designers and subject-matter experts develop and share the much richer language and concepts required for learning in the 21st Century. They can facilitate communication within interdisciplinary and multi-perspective teams.

Example patterns

Here are some examples based on the patterns that the E-LEN network has identified within each of the three of areas of design represented in Figure 1: social context (organisational forms), physical context ('space', tools, resources) and learning tasks. (Note that these patterns are presented below in the simplified 'Alexandrian' structure. You can find the fully detailed E-Len patterns at: <http://www2.tisip.no/E-LEN>)

1. *A pattern concerned with the social context: organisational forms and community*

Name: VIRTUAL ASSISTANT

Collaborative telelearning emphasizes collaborative interactions between students and facilitators in online learning communities. There are many advantages to telelearning, but, where there are no, or few, face-to-face meetings, the need for learners to co-ordinate interactions amongst themselves (for example, when working in teams) and for learners and facilitators to interact with each other, inevitably places a heavy load on all involved.

Salomon¹³ recommends that collaborative learning environments should be designed to encourage mindful engagement (voluntary expenditure of task-related mental effort) among the participants through genuine interdependence. Genuine interdependence is characterized by Salomon as the necessity to share information, a division of labour and the need for joint thinking. In such settings there is a need for monitoring and facilitating this kind of pedagogy¹⁴.

These guidelines are useful, but we often see that students have difficulty following and structuring joint cohesive interaction on learning tasks when working collaboratively in distributed teams. The results may be: little activity, scattered contributions, alienation, students feeling that they are wasting their online time, and high dropout rates. There may be unwanted group effects such as 'ganging up on the task' and the 'sucker effect'¹⁵.

We can look at the complexity of collaborative telelearning scenarios from two different points of view:

- From the instructor's view, collaborative telelearning is hard to monitor and facilitate. It is difficult to spot when a point of genuine activity occurs (for example, whether students are working online or not). Progression is often not streamlined because of differences between individual timetables, local cultures and personal preferences.
- From the student's perspective, similar problems make it difficult to co-ordinate and align joint collaborate activities.

The problems of co-ordinating the distributed learning activities often require a tremendous effort from both students and facilitators.

Therefore

Move some of this burden from humans to ICT-based artifacts. Provide each student (or team of students) with an assistant or 'virtual friend'. This virtual friend monitors what goes on and gives sound advice on how to collaborate in e-learning. The assistant should keep track of what is happening in the student's virtual environment (assignments, news, messages, collaborative task progress, and so on), and in this way support and strengthen the necessary interdependencies between actors in collaborative telelearning environments.

(A number of existing computer applications make use of virtual assistants; for example: Microsoft Word's Office Assistant.)

Related patterns:

PERSONALIZATION

2. A pattern concerned with the physical/digital context: learning resources

Name: RICH INTERACTION WITH TEXT

Learners must actively engage with written texts to learn from them. Some of this activity may take place purely in the learner's mind as they pose questions to themselves about what the text is saying, or construct counter-arguments to it, for example. But many activities require a more direct and physical interaction with the text itself. This can be hard to achieve with simple on-screen material.¹⁶

We have had centuries to develop ways of relating to words written on paper. Many early manuscripts were treated with great respect and kept in highly valued libraries; but since the invention of printing and, more recently, photocopying, we have had ready access to printed documents that can be customised for our own learning. Learners can and do scribble in the margins, turn down page corners, highlight key phrases, arrange papers in stacks and even hurl documents across the room.

Many learners find it difficult to work with on-line material because they are used to particular methods of studying paper-based courseware and dislike 'passive' reading from the screen.

Teachers may need to mark or make annotations on students' assignments or deliverables or even web pages of the learning material in order to pinpoint some critical issues and disseminate either publicly or privately to the learners.

Learners who work with on-screen materials need at least to be able to replicate the types of interaction they can have with printed materials. Although learners may sometimes print documents out, this immediately loses all the benefits of having the document in an electronic form (e.g. it is no longer easy to share it with others).

Therefore:

Provide the learner with a rich set of tools to enable them to interact with the displayed text. These tools should, at least, enable them to:

- underline, strikethrough and highlight sentences using various coloured 'pens' for creating annotations on the text
- put bookmarks on points of interest and/or make comments within hypertext using either "free text" or specific notations (where a specific symbol mean "question mark", "criticism", etc.)
- add annotations in any format (text, image, hyperlink, audio, video)
- characterize an annotation as private or public
- search for annotations by making queries with respect to the date, the author, or the annotation type.

(A number of existing systems provide the ability to set bookmarks: WebCT, VirtualU, Blackboard, CoSE, Intralearn, TopClass, LearnLinc, FirstClass and LearningSpace; while CoSE, Intralearn, FirstClass and LearningSpace provide annotation tools albeit with less functionality than that described above.)

Related patterns:

MOVING MATERIAL INTO THE 'LEARNPLACE', TRANSITIONS BETWEEN PRIVATE AND SHARED RESOURCES ...

3. *A pattern concerned with tasks and activity*

Name: DEBATE

The exploration of contradictory views can promote a deeper understanding of a subject. It can stimulate each participant to develop their own opinions and explore their reasons for them. However, students are sometimes reluctant to challenge each others' views.¹⁷

When a group of students engages in a discussion it is common for individuals to hold contradictory views. A constructive exploration of these differences can assist learning by causing the students to examine their beliefs and opinions and assess them in the light of others' views. In some cases, students come to a consensus. In others, students continue to hold different beliefs but have a greater understanding of both their own, and opposing points of view.

Sometimes students do not spontaneously generate any differences of opinion about the subject matter, but different opinions exist in the field under discussion. In this case it can be useful for the teacher to cause the students to explore the contradictory views by engaging in a debate.

Providing a structure for debate can enable students to explore different opinions in a fair and equal manner that is not confrontational or challenging to individual students' sense of self-esteem.

Therefore

Identify two or more students to 'speak' to each side of a motion. Give them equal time/space to make a contribution setting out their views. Once they have made their contributions, open the discussion to everyone in the discussion group. At the end of the period defined as the lifetime for the debate, invite the proposing and opposing speakers to sum up. End the debate by taking a vote on the motion.

Related patterns:

DISCUSSION ROLES, VOTES...

Part II: Workshop material

In this part of the booklet you will find material for use in a workshop that is designed to develop patterns. Our experience is that the hardest step in developing patterns is that of identifying a pattern. This is probably best approached by one expert practitioner, or a small group of practitioners, engaged in a reflective process over a number of days or weeks.

Other parts of the pattern development process can readily be tackled within the constraints of a short workshop. In this booklet we focus on (a) identifying patterns and understanding the pattern development lifecycle (b) critiquing patterns (c) identifying related patterns (e.g. patterns needed to complete and embellish an existing pattern). Further information and resources can be obtained from the E-LEN website.

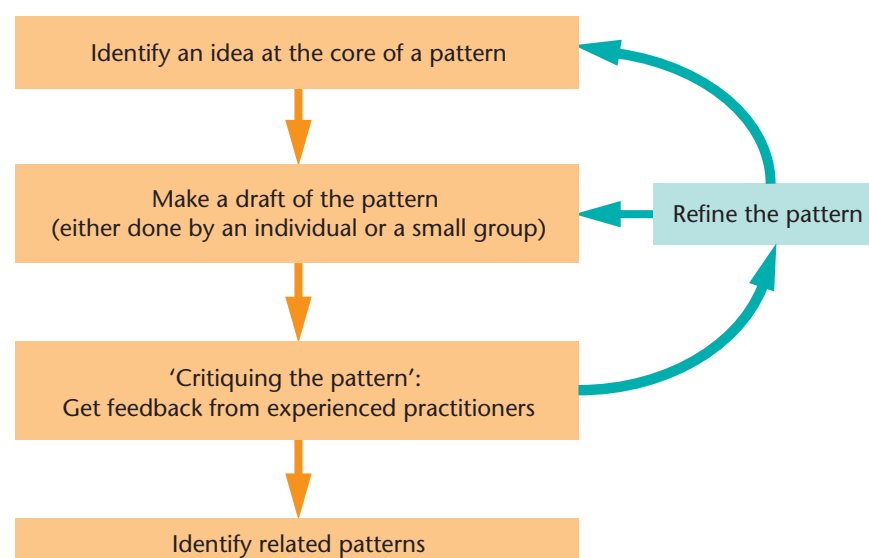
Identifying patterns

Identifying patterns is hard. Once we have a good pattern, it is easy to see that it is good, or to see how it might be improved or moved to a different level of abstraction, but capturing a pattern initially is extraordinarily difficult.

Sometimes what we are trying to capture is tacit knowledge that can be reached by a careful questioning of an expert designer about why they design in a certain way. More often we only have access to the good design principle – or pattern – by distilling it from our personal observations about specific instances of good design.

The pattern development life cycle

The pattern development life cycle follows a simple outline:



Generating patterns

Patterns can be generated by one of two ways: an opportunistic approach, or a top-down approach.

The opportunistic approach

With the opportunistic approach to pattern writing, you come across a learning situation that seems to work particularly well and get a sense that there is something 'right' about it. You then need to identify three essential things:

- What exactly is right?
- Why is that something helping to make the situation alive?
- Where or when will this pattern work?

The opportunistic approach is in many ways the most satisfactory, and most true to Alexander's original approach in architecture. It takes as its starting point an observation about the quality of an actual situation and then tries to pin down exactly what it is about that situation (and others like it) that is good.

The top-down approach

Alternatively, you can start by trying to identify those things for which you know that you need a good pattern by using a top-down approach. This could be by brainstorming within a group of experienced practitioners, or working from an existing text on elements within the design of learning.

The top-down approach provides a faster way to generate a large number of potential patterns. But by working in a top-down way you may become constrained by a pre-existing taxonomy of learning activities and outcomes and lose the potential to capture essential truths about the experience of learning.

Invariance in a pattern

The hardest part of finding a good pattern is to distil out of our everyday experience that thing that all good solutions to the problem have in common. Alexander claims that:

"The task of finding, or discovering, such an invariant field is immensely hard. It is at least as hard as anything in theoretical physics."¹⁸

For a pattern to be effective it must capture this invariance, otherwise the pattern will specify only one particular solution, or a subset of solution, to a problem.

Critiquing patterns

"When you first see a pattern, you will be able to tell almost at once, by intuition, whether it makes you feel good or not: whether, you want to live in a world which has that pattern in it, because it helps you to feel more alive.

If a pattern does make you feel good, there is a very good chance that it is a good pattern. If a pattern does not help you to feel good, there is very little chance that it is a good pattern.

We can always ask ourselves just how a pattern makes us feel. And we can always ask the same of someone else.

Imagine someone who proposes that modular aluminium wall panels are of great importance in the construction of houses.

Simply ask him how he *feels* in rooms built out of them.

He will be able to do dozens of critical experiments which ‘prove’ that they are better, and that they make the environment better, cleaner, healthier.... But the one thing he will not be able to do, if he is honest with himself, is to claim that the presence of modular panels is a distinguishing feature of the places in which he feels good.”¹⁹

Once you have the draft of a pattern, you need to get other practitioners’ feedback about its validity. Here are two suggestions for ways to critique patterns: The first is from the work of Neil Harrison. The second comes from work of members of the E-LEN team.

Guidelines for the evaluation/critique of design patterns

In the Language of the Shepherds²⁰, Neil Harrison describes the process of ‘shepherding’– providing guidance to the writer of a pattern so that they can improve the pattern they have produced.

Harrison presents a number of patterns on how to carry out effective shepherding. Despite some inherent complexity in the idea of using patterns to improve the evaluation of patterns, there is some good information contained in this work. The author describes the following:

1. Immediate start (how to manage time and work on patterns iteratively).
2. The shepherd knows the sheep (the relationship between the reviewer and the author of the pattern under review).
3. Author as owner (ensuring the author retains ownership of the pattern).
4. Big picture (ways to establish a common understanding between the shepherd and the sheep over what the pattern is about).
5. Matching problem and solution (the need to ensure that there is a good match between the pattern and the solution).
6. Convincing solution (the need to challenge the author over the strength of the solution).
7. Forces define problem (how to use the statement of forces to improve the statement of the problem).
8. Balanced context (the need for the pattern to remain focused on a concrete context).
9. Interlaced comments (interlacing comments within the pattern so that it is clear what they apply to).
10. War stories (using real-life experiences to clarify the pattern).
11. Form follows function (the need to find an appropriate form for the pattern).
12. Small patterns (how to keep patterns small – by identifying them as several patterns if necessary).

Design pattern checklist

The following checklist was developed by the E-LEN team based on the work of Meszaros, and Doble, Lea and Coplien.²¹

Does the pattern contain a recognizable problem, which occurs over and over again in your professional practice?	<input type="checkbox"/>
Does the pattern give a clear and concrete description of the problem?	<input type="checkbox"/>
Is there a good description of the forces that act to generate the problem?	<input type="checkbox"/>
Does this pattern capture expertise that is not intuitive to inexperienced practitioners?	<input type="checkbox"/>
Is the pattern too long or too complex? Should it really be more smaller patterns?	<input type="checkbox"/>
Are the style and the presentation of the pattern clear so that people can easily determine whether the pattern applies and how they should use it?	<input type="checkbox"/>
Is this pattern comprehensible without reading all the related patterns? (Is it an 'independent' pattern?)	<input type="checkbox"/>
Is it clear for what audience this pattern is written?	<input type="checkbox"/>
Is the terminology used familiar and clear? If not, is there a glossary with definitions available?	<input type="checkbox"/>
Is the solution to the problem described at the right level of abstraction such that it captures a basic truth that is true to all solutions to this problem.	<input type="checkbox"/>
Is this pattern adequately related to other patterns?	<input type="checkbox"/>
Is the name of the pattern meaningful? Can you guess what the pattern might be about based only on the pattern name?	<input type="checkbox"/>

Identifying related patterns

Once you have started to capture some patterns, you can work from them to identify related patterns.

1. If you are working on a large and complex pattern, you may need to break it down into several related patterns. Check to see whether the pattern contains more than one solution – if so, it should be more than one pattern.
2. Ask yourself what lower level patterns are needed to complete or elaborate on an existing pattern.
3. Work through your set of patterns and consider how they link with each other. Document these links within the patterns.

Part III: Notes and references

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- 3 *A pattern language* (note 1), p.x.
- 4 *ibid*, p xxxv.
- 5 *The Timeless Way of Building* (note 2), p. 207.
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- 7 See for example the *Pedagogical Patterns* website at <http://www.pedagogicalpatterns.org>
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- 17 This pattern is based on Morten Paulsen’s pedagogical techniques for online learning: Paulsen, M. F. (1995). The online report on Pedagogical Techniques for computer-mediated communication, <http://www.hs.nki.no/-morten.emeped.html>.
- 18 *The timeless way of building* (note 2), p.261.

- 19 *The timeless way of building* (note 2), p. 290.
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About E-LEN

E-LEN is a European network of institutions with e-learning expertise. The network was established to share and develop information and design patterns regarding e-learning. An important activity of the network is the dissemination of design patterns to interested parties.

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