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## Negotiation of pedagogical design patterns as a means to enhance communities of practice in university teaching

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## **Negotiation of pedagogical design patterns as a means to enhance communities of practice in university teaching**

Abstract:

"Design patterns" were originally proposed in architecture and later in software engineering as a methodology to sketch and share solutions to recurrent design problems. In recent years "pedagogical design patterns" have been introduced as a way to sketch and share good practices in teaching and learning, specifically in the context of technology enhanced learning ("e-learning patterns"). In a competence development project for teachers across our university, the negotiation of design patterns sketched by teachers themselves was used as a means to enhance communities of practice around the sharing of ideas and experiences with teaching and learning. Rather than a formal pattern language aimed at a database of design patterns, the real potency of the methodology arises from the very process of negotiating suggested patterns and the resulting elaboration of teachers' conceptions about problems, solutions, resources and activities involved in their own teaching.

Keywords: Pedagogical design patterns, technology-enhanced learning, university teaching, knowledge sharing, communities of practice

### **Introduction and theoretical framework**

The idea of design patterns was originally proposed by Christopher Alexander (1977; 1979) as a way to describe functional and beautiful buildings and places of the vernacular traditions in architecture and urban design. According to Alexander good architectural design on any scale from individual building elements to whole town areas constitute a kind of pattern language that have developed through experience with good solutions to recurrent problems of dwelling, playing, working, transportation and other activities. In the 1990-ies design patterns were developed by analogy into a quasi-formal graphical language to describe alternative solutions to recurrent problems in software engineering within object-oriented programming languages (Gamma, Helm, Johnson & Vlissides 1995). The focus was on established good practices of programming, as well as on the intelligibility and reusability of generic solutions that could then be adapted to specific circumstances and objectives. Design patterns were accordingly used to teach software engineering in order to help students structure and document their programming, but also to assist reasoning about alternative solutions. This framework was later extended to include "anti-patterns" of bad practices to avoid (Brown, Malveau, McCormick, & Mowbray 1998) as well as specialized design patterns for interaction design (Tidwell 2005).

Inspired by the widespread use of design patterns in teaching software engineering and interaction design there is now a growing interest in extending the concept to university teaching, and specifically within technology-enhanced learning (Goodyear, & Retalis 2010; Kohls & Wedekind 2011; Mor, Mellar, Warburton & Winters 2014). These "e-learning patterns" will, however, have to be seen as specific patterns for the pedagogically and didactically motivated use of digital media and information technologies as resources within a broader conception of teaching and learning. We need, in other words, a broader conception of *pedagogical design patterns* to articulate what works in teaching and learning, within which we can situate specific uses of media and technology. Such a conception has been worked out by Diana Laurillard in her specification of teaching as a *design science* (Laurillard 2012). Teachers are basically designers of didactic situations and

learning environments. Knowledge and conceptual understanding cannot be “transmitted” directly, but has to be constructed by students through their collaborative work and active involvement with the resources made available within didactic situations and learning environments. Rather than a collection of specific design patterns Laurillard provides a meta-theoretic framework for analysing technology-enhanced learning as communicative and cognitive processes.

In a competence development project at the University of Copenhagen (2013-2016) a number of teachers involved with “Online and Blended Learning” (OBL) courses were expected to share their experiences with different “e-learning models”. This was to be assisted by e-learning consultants, but initially it was not clear *what* these “e-learning models” referred to – other than the crude difference between fully online versus “blended” learning – and furthermore there was no specific procedure for *how* the sharing of experiences should take place. Gradually the project group became convinced that we could specify these “e-learning models” further by considering more detailed design patterns for the forms of teaching involved, and that we could use patterns as a methodology for elaborating teachers’ own conceptions and for communicating experiences to the rest of the university.

### **The methodology**

There is no consensus about how to represent design patterns, although there is agreement about what a pattern should include. The key elements are a recurrent *problem* of teaching and learning, a suggested pedagogical *solution*, and the *context* of courses and institutions. Furthermore, problems and solutions should be described in a generalized form in order for patterns to be applicable across disciplinary domains. Design patterns have to be adapted and elaborated to specific contexts (Goodyear & Retalis 2010), and can be considered as *abstractions over good practices*.

In addition to this, however, design patterns should abstract from specific technologies. “Flipped classroom” teaching, for example, is often described as video-recording of lectures, but patterns should not be linked tightly to specific technologies, but defined through their *rationale*. The pedagogical rationale for “flipped classroom” teaching is to shift the balance between classroom teaching and homework in order to focus classroom time on interactive forms of teaching rather than on “covering” the curriculum in lectures.

In the project patterns were introduced at a workshop through examples, and groups of teachers worked on their own teaching. The idea was not to impose any specific patterns, but to have teachers explicate and externalize some of their own implicit patterns based on a pattern template (Figure 1). Before a second workshop the outlined patterns were harmonized by researchers in order to enhance a common format and support mutual understanding, and this then led to further elaboration and negotiation. When planning the workshop the group of associated researchers discussed the possibility of organizing it as a game-like puzzle with different types of puzzle pieces for problems, pattern names, pattern descriptions, use cases, resources (activities and tools/media), but in the end we thought that this would restrain the work too much. Instead we presented examples of patterns using the template and instructed groups of teachers to select one or two patterns to specify on their own.

We found it useful to introduce a modification of the approach with regard to the point of departure for pattern formulations: teachers may want to improve teaching by reflecting on solutions to recognized

problems, as prescribed by “regulative” patterns, but even teachers who do not experience any specific problems in teaching may want to *experiment* in an attempt to “optimize” teaching and learning.

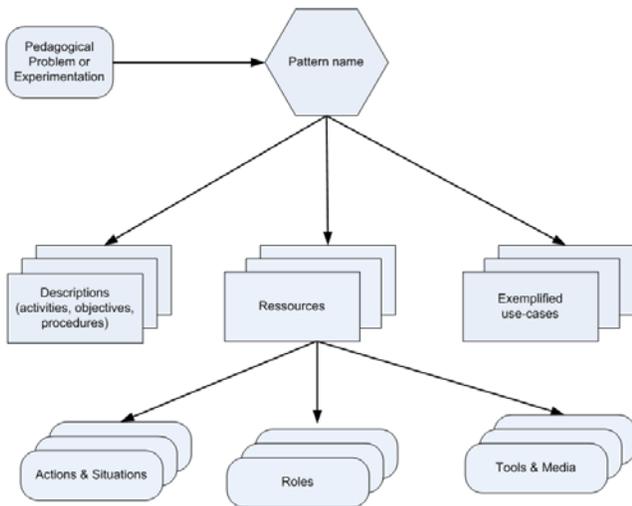


Figure 1. Diagram used to explain the idea of pedagogical design patterns in the OBL project

### Findings and conclusion

The pattern workshop produced flip chart sketches (Figure 2) some of which represented stand-alone patterns such as “virtual field trips” (in the context of global health education), whereas more complex patterns were “virtual experiments”, “e-lessons” and instructional “learning paths” – all abstracted from the disciplinary domains of their course contexts (neutron scattering, climate change, biomedical statistics).



Figure 2. Workshop presentation of pattern sketches for “virtual field trips” (left) and “virtual experiments” (right).

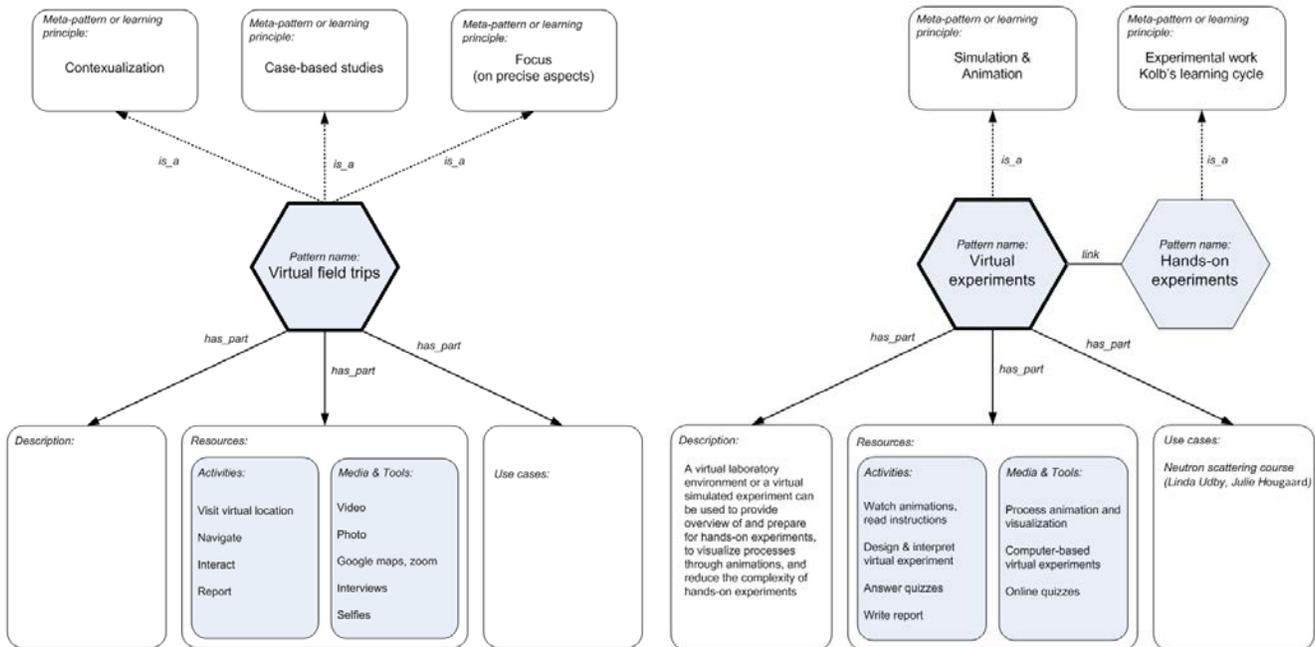


Figure 3. Preliminary harmonized patterns for “virtual field trips” (left) and “virtual experiments” (right).

The problems addressed by “virtual field trips” are the limited resources for traveling and field work, and the need for students to be exposed to more than one case study. The problems addressed by the “virtual experiments” (linked to “hands-on experiments”) are the limited resources for repeating hands-on experiments, and the need to train layout of complex instrumentation before doing hands-on experiments.

We found two dilemmas which seem to limit the rationality of design patterns for sharing good practices:

- *The dilemma of formalization*: some formalization is helpful for schematization of patterns such as the different types of relations involved (is\_a, has\_a, and link relations), but a formal pattern language would pose a pragmatic problem for the formulation of patterns by teachers.
- *The dilemma of scalability*: locally and on a limited scale a collection of patterns can be formulated and maintained by a group of teachers and researchers within the same community of practice as sharing of good practices in teaching. Scaling up this activity for sharing between communities would pose a pragmatic problem, however, because large collections of patterns would require extensive work of identifying similar patterns and maintaining the coherency of pattern formulations.

Similar dilemmas have been raised with regard to the reuse of digital “learning objects” on a larger scale (May et.al 2010).

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