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EDITORIAL

The art and science of learning design

Introduction

The learning design approach, or as some prefer, "designing for learning" (Beetham and Sharpe 2013; Laurillard 2012) stems from the conviction that education is not merely a craft of delivering packaged knowledge. The role of the educator is to create the conditions for learners to learn, by providing them with the motivation for learning, the activities by which they would learn, and the resources and tools they would use in these activities. But if the role of the educator is to enable and facilitate learning, how do we understand learning? The answer to this question would depend on the responder. A computer scientist might define learning in terms of reduction of an error function. A behaviourist may see it as change in responses to stimuli, a social semiotican would perhaps highlight the change of mental and social mappings of signs and signified. However, all interpretations emphasise change – from an existing pattern of action or intentional state to a preferred one. This realisation leads Laurillard (2012) to call for a re-positioning of teaching as a design science, and acknowledging the role of teachers as designers of learning. Teaching, argues Laurillard, is a design science (or practice) more akin to engineering than physics or psychology, because it explicitly strives for change.

> Engineers are not the only professional designers. Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. (Simon 1996, p. 111)

Ertmer, Parisio, and Wardak (2013) define design as a goal-directed, problem-solving activity that results in the creation of something useful that did not exist before. They note that design occurs in a complex conceptual space, which offers both opportunities that can be exploited and constraints that must be satisfied to achieve the desired effect. Mapping this definition to educational practice is an interesting exercise: education is clearly a goal-directed problem-solving practice, situated in a complex space of opportunities and constraints. But what about the requirement of creating something that "did not exist before"? Here lies the distinction between craft and design. A skilled craftsperson knows how to make robust, functional, and aesthetically pleasing objects. A designer creates something new – which also needs to be robust, functional, and aesthetically pleasing. Is education a craft or a design practice? After all, an experienced teacher would reuse lesson plans, resources and even subtle tricks for inspiring and guiding learners. Yet we argue that nevertheless, there is great merit in perceiving education as design. We distinguished between craft – creating artefacts of good quality, and design – creating *new* artefacts of good quality. But design includes both invention (creating something totally new) and innovation (reconfiguring existing things in a new way). Reuse can also be an act of design, if conceived in the right frame of mind. As Latour (2008) says "to design is always to *redesign*" (p. 5).

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Bruno Latour (2008) lists five "advantages" of design: humility, attentiveness to detail, semiotic skills, remedial intent and an ethical dimension. Design is humble, in the sense that the designer accepts her limitations and works within them. It is attentive to detail – as without this attention the best-laid plan will fail. It is semiotic, in the sense that the socially constructed meanings of artefacts are appreciated and utilised. The remedial intention refers to the fact that design is always "redesign", or "relooking" in Latour's words: reusing, augmenting, and improving previous designs. Finally, in line with Simon and Ertmer *et al.* (cited above) design is aimed at positive change, making something useful. The question of what change is desired, what state of the world is preferred – brings in the ethical dimension. We argue that all these five "advantages" are relevant and perhaps critical to educational practice, and warrant the positioning of educational practitioners as designers. Educators are unquestionably humble, in the sense of acknowledging their constraints and working within them. To succeed, they must pay close attention to details of multiple aspects of their context, from organisational and institutional structures, through practical classroom management issues, to the core pedagogical and epistemic practices they promote. The semiotic, or social semiotic, aspects of education have been studied extensively (cf. Jewitt 2001; Kress 2010; Lemke 1997; Morgan 2006). The remedial, or re-design, is ever-present in educational work: even when repeating the same lesson year after year, a teacher will adjust, improve, and reconfigure semiotic resources to achieve a better effect. Last but not least, education is perhaps the ultimate value-driven, change-oriented practice.

Furthermore, educators need to constantly respond to a shifting educational context – with the introduction of new technologies, practices, and open resources. Luckin *et al*. (2013) describe a learning design process that is based on understanding and orchestrating an ecology of resources available to the learner. Their approach can be seen as a structured interpretation of the tacit work of educators: realising which resources are present in the learning context and how to make use of these to advance educational objectives. As these resources evolve, so does the educators' practice. Consequently, education is by necessity a practice of design, often in the context of design communities (Hernández-Leo *et al*. 2012).

Research and practice in learning design aims to make the tacit practices of design for learning explicit, provide suitable textual, visual and computational representations to support these practices, and suitable tools to manipulate them and share them. Conole and Wills (2013) declare: "Designing for learning is arguably the key challenge facing education today" (p. 24). Is this true? Learning design, as a field, boasts over a decade of rich activity in research, development and practice (Craft & Mor, 2012). The Larnaca Declaration (Dalziel 2012) presents an impressive map of activities, from 1999 to the present, which includes over 40 projects, tools and representational frameworks. Dobozy (2013), conducting a meta-ethnographic review of 34 papers (out of a set of 90), notes that "LD as a specific field of education although relatively new, seems to be attaining a certain maturity" (p. 63).

With such a vibrant and productive research community, why is the core concern of this field still such a great challenge? Dobozy (2013) offers some insights: the works she reviews either present diverse conceptualisations of the key terms (including their definition of learning design) or fail to articulate the concepts altogether. This may be natural for a field that is still young, fast moving, and draws upon diverse traditions. Nevertheless, for researchers or practitioners coming from outside of the community, the lack of a coherent unified frame of discourse can be

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confusing and off-putting. This is compounded by the fact that, as Dobozy (2013) notes, teachers feel doubtful in their pedagogical and technological standing, and feel alienated by academic discourse. Research in learning design is no exception – occasionally slipping into jargon which is inaccessible to practitioners.

Another obstacle to the widespread adoption of the learning design approach is the shortage in "full-cycle" integration and compatibility with institutional systems. LAMS (Dalziel 2006) stands out as a system that supports designers from the initial conceptualisation of their design to its enactment with learners. However, most institutions do not support it. By contrast, most of the learning and teaching support systems used by institutions do not afford explicit representation of learning designs, and most learning design tools do not offer a streamlined process of deploying their outputs to learning and teaching environments. Prieto *et al*. (2011, 2012) highlight this challenge and offer GLUE!-PS as a solution, which is now part of an effort towards integrating existing learning design representations and tools (Hernández-Leo *et al*. 2013). We see this integrative approach as a promising direction, which will have a significant impact in the future.

Thus, we posit that the "grand challenge of learning design" can be summarised by three words: language, practice and tools. Language refers to the representational systems used in the act of learning design, whether these are visual or textual, conceptual or formal, intuitive or structured, and to the flow of discourse between these systems. How do we translate the Jigsaw pedagogical pattern to a LAMS sequence, and how do we present it to a concerned parent? Language also refers to the scientific and professional discourse about learning design. How do we define the key concepts in a precise and coherent manner? How do we present them to practitioners in an intuitive and accessible form? Finally, how do we bridge between the language of learning design and other related fields? How do we link to the body of knowledge in educational design research (Anderson and Shattuck 2012; Mor and Winters 2007)? How do we benefit from the discourse of other design disciplines? How do we forge links with the designs for learning community (http://www.designsforlearning.nu/)?

Representing educational practice is one of the central themes of learning design. Agostinho *et al*. (2011) note that the field stems from two traditions of inquiry: one focused on the machine-readable representations of teaching practice for digital learning environments, and the other on the human-readable representations for sharing design knowledge between teachers. Falconer, Finlay, and Fincher (2011) review and critique several frameworks for representing practice, and demonstrate how no current representation is sufficient to enable effective sharing of design knowledge. Both lines of inquiry raise the questions of representing, understanding and advancing the practices of learning design themselves. This has been a growing concern of the research community. Kali, Goodyear, and Markauskaite (2011) demonstrate the need for careful observation and modelling of teachers' design practices, and note the dissonance between the implicit models of learning design embodied in current tool, and the actual approaches used by teachers in their daily work. They illustrate this dissonance by the idea of "pedagogical knowledge in pieces", a fragmented and ad-hoc collection of pedagogical ideas, which guide teachers in their design practice – rather than a coherent and consistent pedagogical framework. By contrast, Voogt *et al*. (2011) show how engaging teachers in structured learning design enhances their professional expertise and in particular their pedagogical knowledge.

Finally, effective design practices need to be supported by powerful learning design tools. Kali, Goodyear, and Markauskaite (2011) argue that the design of such tools needs to be based on the understanding of existing practices. But it also needs to promote a vision of robust, effective, rigorous and streamlined practices. Such tools need to support the expression of design knowledge in a range of languages. Thus, tools connect practice, language, and knowledge. This may be obvious to anyone versed in activity theory (Engeström 1987). Yet few (if any) current learning design tools are developed through a conscious and deliberate study of the activity system in which they will be embedded, and the ways in which they aim to perturb it.

In this issue

The papers in this special supplement speak to these challenges. Although there is not enough room to fully explore these dimensions in the space available, the papers collected here provide some key insights into the grand challenges we have identified. While all papers touch on the three themes of language, practice and tools – each one has a different balance of attention among them.

McKenney (2013) presents a case for technology-enhanced learning research and development that focuses more on what is practical today than on what could be effective in theory in the future. The paper proposes methodological considerations for the design of clear, value-added and tolerant innovations aligned with the real needs of today's implementation contexts. This perspective calls researchers to include in their studies attention to broad factors focused on how innovations are understood and used by teachers and schools.

Pozzi and Persico (2013) focus on learning design in the Computer Supported Collaborative Learning (CSCL) domain. In particular, the paper discusses diverse existing approaches to design, represent, refine and visualise collaborative learning designs, and proposes a unifying model for pedagogical planning in the CSCL design process, with a strong focus on supporting decision making. The unifying design model considers the four dimensions of Task, Teams, Time and Technology.

The next two papers are related and, therefore, organised sequentially. Goodyear and Dimitriadis (2013) go beyond considering design as a significant task of the teaching practice and focus on the role of design as a relevant means of helping people learn. The paper discusses why it is important to have a theory of design for learning and set out some of its elements. Key issues addressed in the paper are around the different actors involved in a framework of design for learning (people creating designs which can help other people learn, the learners, teachers supporting people learn) or the kinds of things that can be designed and re-designed, and how they may relate to multiple learning layers and goals.

Having thus provided their design perspectives for a useful theory of design for learning, in the next paper Dimitriadis and Goodyear (2013) turn to the recent design for learning literature to illustrate their forward-oriented design approach. They focus on two key facets of the approach, *design for orchestration* and *design for reflection*, and identify key points for reflection upon their design approach. They then draw upon fieldwork from two case studies to highlight how their approach addresses important design problems and provides suitable solutions.

Masterman and Craft (2013) further emphasise the importance of theoretical grounding, turning their emphasis to the problem of the selection of representations of learning designs. To capture learning designs requires representing them in some

way, both during and after the design process. The authors propose using a framework for epistemic efficacy adapted from the cognitive psychology literature, to aid in evaluating the effectiveness representations. To illustrate this, they show how the framework can be applied to the evaluation of one pedagogic planning also, the Learning Designer.

Continuing the theme of design representations, in the next paper, Katsamani and Retalis (2013) discuss the tension between formal representations of learning designs (such as IMS-LD) and the concerns of educational practitioners, who are not versed in technical formalisms but need intuitive visual and textual representations which are easy to share and manipulate. They compare five popular LD tools (MOT+, Compendium, WebCollage, OpenGLM, and LAMS) using five criteria: usability, guidance, formalisation, pedagogical neutrality and design flexibility. They argue that no single tool satisfies all five criteria. They propose CADMOS as a tool which aims to address these concerns, by guiding practitioners in a design process which is based on the principle of "separation of concerns": maintaining two parallel models of the design – a conceptual model and a flow model. They discuss the results of a user evaluation of the tool, and map its future development.

As the number of learning design tools and representations continues to grow, it becomes more difficult to keep track of them and to engage with them. Therefore, not many researchers or practitioners have time to try more than a few tools, and they are unlikely to use several different tools to author the same design. They are perhaps even more unlikely to take into consideration different approaches to the learning design process, itself. This is especially true for practitioners, who must cope with the day-to-day demands of teaching. Hence, the motivation for the concluding two papers in this supplement. We take our inspiration from the internationally acclaimed film, *Rashomon* (1950) by the late Japanese film director, Akira Kurosawa. *Rashomon* is notable not only because it introduced Japanese cinema to Western audiences, but also because of the novel plot device used by Kurosawa, in which the same narrative (a mysterious murder) is revealed from the perspectives of three different characters. We hope to provide the same benefit of multiple viewpoints in the papers Rashomon I and Rashomon II. As a result, these two concluding papers are rather different to the traditional research literature, but we believe they provide compelling perspectives on the contemporary opportunities and challenges in our field.

Persico *et al*. (2013) consider the tensions and possible synergies between different approaches to LD by examining a single activity – the PI project Healthy Eating activity (Anastopoulou *et al*. 2012) through the lens of five different design approaches, each supported by particular representations and tools. These approaches are the 4SPPIces Model, the 4Ts, the e-Design Template, the Design Principles Database and the Design Narratives. The authors compare the various approaches according to their underlying pedagogical assumptions, their mode of use, and their advantages to the designer and educator. Each approach guides the designer through key decisions in the design process (or in the case of Design Narrative – in post-hoc reflection on it). The comparison does not claim to be extensive, or to conclude that one approach is superior to another. Its value is in exposing the reader to the diversity of the field and allowing her to form an understanding of what would serve her best in particular situations.

In the companion paper, Prieto *et al*. (2013) take the approach of modelling the same activity using five different tools. The authors use the same "healthy eating"

activity from the PI project and describe how this inquiry-based learning scenario is implemented in all five tools, providing illustrations and a detailed discussion for each. They are thus able to uncover key differences and similarities among the tools. These entail differences in their use and usefulness, their audiences, and pedagogic specialties, among others. This comparative approach therefore also illustrates some of the key contemporary challenges for the field of Learning Design.

Reflections and futures

We argued that the grand challenge of learning design can be summarised by the words "language, practice and tools". Each one of the papers in this volume explores these three themes, through a different lens and with a different balance between them. We encourage readers to keep the questions we raised in mind when reading these papers. Which opportunities do they demonstrate, and which challenges do they illuminate in terms of the language for sharing design knowledge and the language for discussing design at a meta-level? Which insights do they offer in terms of learning design as sharing good educational practice, and in terms of the practices of learning design? What do they teach us about the prospect of providing tools to support the above? Is the conceptualisation of design embodied in these papers aligned with the observations of Ertmer *et al*. and Latour? Do they respond to the challenges identified by Dobozy and Prieto *et al*.? Or to the critique of Falconer *et al*.?

We believe that the great deal of enthusiastic research in learning design will continue to be fruitful for other researchers, teachers, and not least, learners. Indeed many of us within the research community have been or continue to be teachers and learners ourselves. Although we are from diverse backgrounds, we face the common challenges of mutual collaboration, sharing, and support in the complex social and increasingly, socio-technical process that is 21st Century learning. The work in this special issue here is emblematic of the aspirations to meeting these challenges, together.

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