Activity centred analysis and design in the evolution of learning networks

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Abstract

This paper provides an overview of, and rationale for, an approach to analysing complex learning networks. The approach involves a strong commitment to providing knowledge which is useful for design and it gives a prime place to the activity of those involved in networked learning. Hence the framework that we are offering is known as "Activity Centred Analysis and Design" or ACAD for short. We have used the ACAD framework in the analysis of 20 or so learning networks. These networks have varied in purpose, scale and complexity and the experience we have gained in trying to understand how these networks function has helped us improve the ACAD framework. This paper shares some of the outcomes of that experience and describes some significant new refinements to how we understand the framework. While the framework is able to deal with a very wide range of learning situations, in this paper we look more closely at some issues which are of particular importance in networked learning. For example, we discuss the distributed nature of design in networked learning – acknowledging the fact that learning networks are almost invariably co-configured by everyone who participates in them, and that this aspect of participation is often explicitly valued and encouraged. We see participation in (re)design as a challenging activity: one that benefits from some structured methods and ways of representing and unpicking the tangles of tasks, activities, tools, places and people.

Keywords

Analysis; Design; Representation; Affordance; Complex Learning Networks.

Design and analysis in networked learning: looking back

In the early days of what has come to be called networked learning, things looked simpler than they do now – design did not feature very much. Few of the pioneers of networked learning had control over the design of the tools that were used; the most common tasks were "online seminars" or question-and-answer sessions; we rarely dealt with more than 30 students at a time and the novelty and fascination of the online experience meant that we rather neglected the "offline" lives of students (Mason & Kaye, 1989; Harasim, 1990; Hiltz, 1994; McConnell, 1994; Steeples et al., 1994). Online pedagogy/andragogy was largely a matter of personal philosophical commitment, enacted through carefully crafted text. For the most part, design considerations resolved quite quickly to choices between online versions of familiar pedagogical techniques (e.g. Paulsen, 1995) and the affordances of various communication and collaboration tools with respect to simple task requirements (e.g. Goodyear & Steeples, 1992). "Analysis" normally meant content analysis: various kinds of counts of who said what when in an online discussion (see e.g. Henri, 1992; Howell-Richardson & Mellar, 1996). The motivation for undertaking such analyses was often the intrinsic interest of researching a new phenomenon, as much as to use the outcomes of analysis to inform future design work.

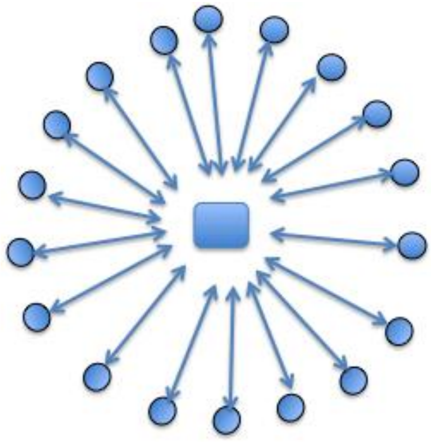

Figure 1: A simple star network, centred on a discussion board

Figure 1 depicts a typical (for the time) star network of 18 people whose interactions are mediated entirely through an online discussion board. It looks and felt directly 'knowable', without the need for special methods of analysis.

Networked learning and learning networks today

In the last five years, our team has been analysing a wide range of contemporary learning networks. Among other things, we have been trying to understand how such networks function and how their architectures – the structuring of their key elements – support valued activities and outcomes (Carvalho & Goodyear, 2014). It should come as no surprise that the scale and complexity of the networks we are analysing make this a much more complicated challenge than it would have been 20 years ago. It is not *simply* a matter of scale. Today's MOOCs, with their starting enrolments in tens or hundred of thousands, mostly have quite simple structures. Many of the learning networks in our investigations have had hundreds of users, or a few thousand in some cases. So the challenge comes from numbers *and* a structural complexity that arises – in large part – from the freedom that people have to distribute their activity across a wide number of platforms and spaces.

Figure 2 captures some of the complexity of just one of these networks. The 'map' in the photograph was drawn by Pinto, as part of her analysis of the architecture of the NALA network (the Irish National Adult Literacy Agency) – see Pinto (2014). The representation she created here needed more than 4 x 2 meters of whitewall. It captures digital, physical and blended spaces. Though it is necessarily a simplification, its complexity shocked the staff at NALA, who had no sense of the scope of what they had created over the years. The NALA network – seen as a combination (assemblage) of people and their activity, digital tools and resources, digital, physical and 'blended' spaces, and so on – had grown through a mixture of planned and organic processes. Villages and towns have grown in similar ways to this – partly through planning, partly through the sedimentation of habitual activities. In describing the changes in scale and complexity in networked learning witnessed over the last 20-30 years, Goodyear et al. (2015) talk about a shift from the 'virtual classroom' to the 'learning city'. So we have to ask: are the tools, ideas and methods that were appropriate for furnishing the virtual classroom adequate to the challenges of city planning or urban design?

The challenge is actually more subtle than this. If learning networks evolve through combinations of planning, improvisation, bricolage and habit – engaged in, in various combinations, and over various stretches of time, by people in quite diverse roles, then how should we think about the tasks of analysis and design? It seems clear that any discussion of methods for analysis and design needs some grounding in the positions, practices, aspirations and obligations of those involved. In short, one needs to think about the pragmatics of analysis and design, as practiced by those with a stake in the learning network. This is the main focus of our paper. How can the various participants in a learning network become more capable of understanding the network and how it functions? How can they become better at shaping its future?

We take these to be complex and important challenges. We are not convinced that the tools provided by critical theory or instructional systems design come close to meeting the need.

Figure 2: Architecture of the NALA **network (Pinto, 2014)**

Activity Centred Analysis and Design (the ACAD framework)

When we are concerned with human learning, activity is key: what people are actually doing is what matters. By "doing" we mean all sorts of human activity: thinking, feeling, perceiving, talking, making, moving, and so on. What people are actually doing is real and *matters*, whether one views learning as a process of acquiring knowledge, participating in social practices, creating new knowledge and/or reshaping the environment (Sfard, 1998; Paavola et al., 2004; Markauskaite & Goodyear, 2015). Consequently, a framework for analysing learning networks needs to have ways of placing real-world human activity at its core: it needs to be activity centred, And since human activity is best understood as both physically and socially situated, such an analytic framework needs to be able to identify and represent such things as material artefacts, digital tools, social structures, divisions of labour and other organisational arrangements that shape and are shaped by the human activity. For some researchers, this means taking an *activity system* as the unit of analysis (e.g. Greeno, 2006). Or, one might prefer to think of ecologies (e.g. Hutchins, 2010) or – in the present case – learning networks.

To make an analytic choice – say, networks rather than systems – is not to make a claim about how the world is structured. Rather, it foregrounds certain kinds of phenomena – entities and relationships – it sensitises perception in a certain way and favours the production of certain kinds of representations, such as network diagrams. Moreover, our choice of an analytic approach is strongly influenced by practical purposes. We see the primary purpose of analysis as being to inform design. This has a number of corollaries. First, it means that the outputs from analysis need to take a form that can influence the work of designers: the emphasis is on actionable knowledge. Second, the actual working arrangements of designers need to be understood, as a source of requirements and constraints on what counts as actionable knowledge. This helps distinguish between (a) analyses that are placed in the public domain, in the *hope* that an account of how a learning network functions may inspire and inform those designing for other learning networks, and (b) analyses that feed into (re)design and enhancement processes *within* a learning network. Third, if analysis is feeding forward into such local (re)design work, then pragmatic issues of timing, constrained design resources, and priorities become very important. They can provide useful guidance to analytic work – helping focus analytic effort on what is thought to matter most, or what is next in line for adjustment, and providing deadlines beyond which analytic insights are no longer useful. In short, analysis for design resembles formative evaluation – though, in our experience, formative evaluation is rarely given the resources it needs to go beyond saying what is, and is not, working well. It rarely gets a chance to do the fundamental job of analysing *how* something works. There are two additional distinguishing points to make about the ACAD framework.

Most important of these is the notion of *indirection* in design for learning (Goodyear, 1997, 2000; Jones et al., 2006; Jones, 2015). Activity is key, but activity cannot be designed. Rather, design for learning has to work indirectly by proposing *tasks* – suggestions of good things to do – which may stimulate and otherwise influence the real-world activity that eventuates, but which cannot prescribe or actually generate that activity. In other words, there is no mechanism linking proposed tasks directly to learning outcomes; the relationship is mediated by activity. This necessarily indirect relationship also applies to other components of design, such as the design of learning tools and other kinds of learning resources – which physically situate learning activity – and proposals to people about how they might best work together – which are part of what makes learning activity socially situated. Activity mediates relations between design and outcome (Figure 3). This is one way of explaining why it makes little sense to ask “does gadget x improve learning?” or “is it better to work in small or large teams?”

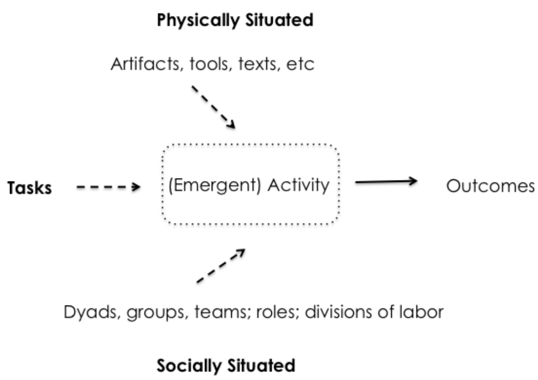

Figure 3: Activity is physically, epistemically and socially situated and mediates outcomes

The second main distinguishing point is an extension of the first. The fact that active learners – more generally, people – exercise some autonomy in deciding what to do and how to do it, can be captured by saying that they co-configure their own learning arrangements in co-creating their own knowledge (Carvalho & Goodyear, 2014). We now want to extend that notion, to say that it can often be valuable for everyone involved (e.g. teachers, learning designers, organization stakeholders, network participants) in networked learning to take a more conscious, systematic approach to the co-configuration of learning arrangements. In other words, everyone can and should contribute to design – to some degree, from time to time. Design in networked learning is better if it is a distributed activity: better in the sense that learning networks are thereby more likely to evolve in line with emerging needs across the network, and better in the sense that becoming a more able designer can bring rewards in other contexts. Markauskaite & Goodyear (2015) speak about this in terms of conscious and conscientious inhabiting of a learning environment. Clarke (e.g. 2008, 59-60) calls it “self-engineering” better worlds to think in. Sterelny (e.g. 2014) talks in broader terms of a unique human ability for niche construction: re-engineering the biological, physical and informational environment(s) to favour cooperative action and learning.

Evolution of complex learning networks

The learning networks we have studied vary along a number of important dimensions – some of which are very important if one wants to understand the evolution of a learning network over time. For example, some learning networks in formal (higher) education settings are effectively "reset" at the start of each academic year. All the texts and other artefacts created by students, and all their local reconfigurations and enhancements, are destroyed (or archived). Any evolution from one year to another has to take place through deliberate actions of the "network owner" (a lecturer, or teaching team), informed – in part – by what recent cohorts of students have done. In contrast, some other networks evolve continuously over years. They may go through some periods of rapid development, redesign etc., but also have long periods in which change is by small increments. On a related dimension, we see that some networks evolve mainly through the actions of large numbers of participants – the process could be called "organic" – while in other networks, there are periodic, substantial changes implemented through a serious process of (re)design. So there is no single, simple story about the evolution of learning networks. Which means that approaches to analysis have to be flexible: they have to be able to help us understand processes of change that are secular and cyclical, gradual and dramatic, organic and imposed. Moreover, they need to help all participants in a learning network understand their learning network, how it functions, and what the consequences may be of changes they make – whether "designed" or otherwise.

At a minimum, we have come to conclude that participants in learning networks can benefit from ways of seeing how tasks, tools, places and people become entangled in their activities – and how some analytic untangling is necessary when thinking about (re)design. We also want to reject a polarisation in conceptions of how learning network evolution is best enabled. In short, there is an "insider-emic-vernacular" conception that stands against a conception which privileges design/rebuild interventions imposed "from on high" – "outsider-etic-industrial". As we have hinted above, both of these need to be better understood. In fact, we need ways of thinking and working that meld them in more productive practices.

Analysis and representation

Jones (2015) has identified three key concepts that are fundamental to thinking about networked learning: affordance, agency and assemblage(s). Rightly, in our view, he distinguishes between the properties of a tool and its affordances. The former are real, and exist independently of the awareness and actions of human beings. They persist over time. Whereas affordances are best understood as relational – they are what the tool offers a particular user, or class of users. Pushing this further, analysing the entanglement of tools (etc) in human activity, with a view to understanding how to (re)design or select new tools that are better for the job, requires an understanding of how one tool can be said to be better than another, for a class of users and for a class of task. Figure 4 is one way of representing such relationships. It is derived from an analytic technique developed in archaeology and anthropology for representing sequences of actions involved in performing tasks with tools: the so-called "*chaînes opératoire*" (Sellet, 1993; Knappett, 2011).

On the left side of Figure 4 is a classic *chaînes opératoire* representation, which (for present purposes) can be interpreted as a set of operations (e.g. striking a flint blade from a core) that are grouped in sequences that fall into phases (e.g. selecting a good flint core; storing finished blades). That is, there is a simple hierarchical structure of sub-tasks within tasks, as one moves from left to right, and the normal flow of operations is linearly from top to bottom. In actuality, there may be cycles of operations, loops back or jumps forward, depending on outcomes of individual operations. In our terms, only the operations (the pentagons) are activities: they are actual work in the real world, whereas sequences and phases are sense-making labels applied discursively in accounts of the work. Our addition to the right hand side of Figure 4 helps make two further things explicit. First, each of the operations (pentagons) makes a change to an artefact (shaded circle). The chain of operations successively transforms an artefact towards its finished state. Second, each of the operations requires a toolset (white cross shape). Moving from flint knapping to contemporary learning networks, we could imagine the evolving artefact as a text or multimedia resource being created by a group of students – moving through phases of brainstorming, drafting and polishing, for example. When considering the tool(s) needed for each operation, attention needs to be paid to the requirements of the operation, its place in the larger scheme of work, the state(s) of the artefact, and the skills of the actors. This is a more complex notion of affordance – and we want to argue that this more elaborate notion is part of what allows skilled practitioners to configure their working environment efficiently and effectively. While it might be tacit knowledge for experienced practitioners, the absence of an explicit representation makes it unnecessarily hard for novices to learn their craft. If nothing else, encountering representations like that schematised in Figure 4 can encourage people to think in terms of the "fitness" of specific people-tool-activity combinations, rather than trying to make deductions from abstract generalisations about classes of tools or types of places.

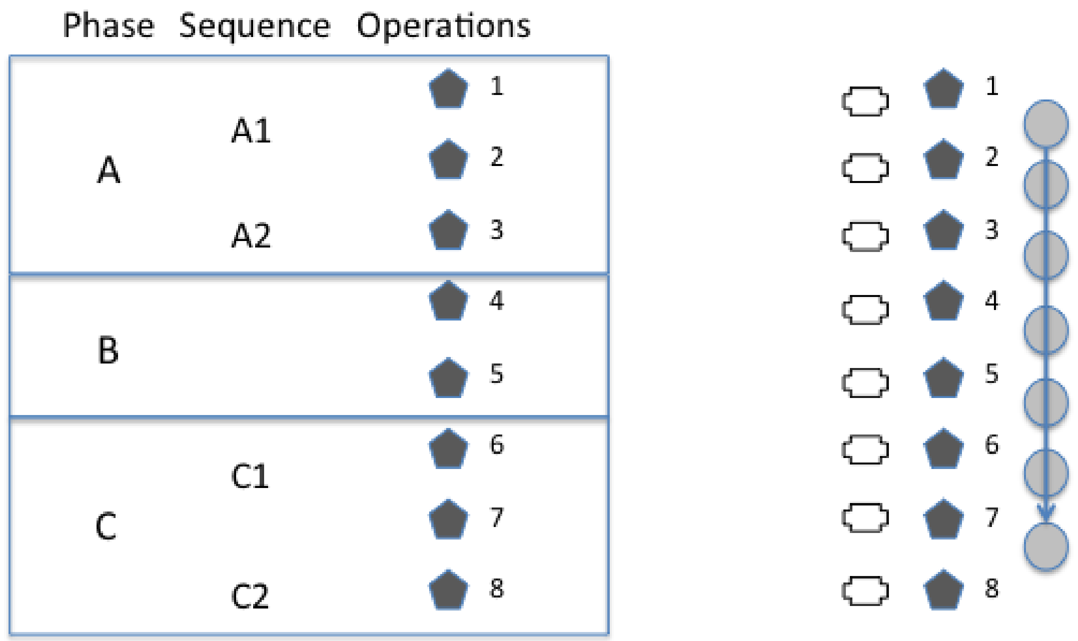

Figure 4: Modified *chaînes opératoire* representation

Representations & (re)design

At some critical moments in the evolution of a learning network, complex (re)design challenges need to be faced. We focus here on challenges where design solutions are not self-evident, and where decisions have to be reached through a process of joint sense-making and consensus forming. Where solutions are seen as simple or self-evident, they can be arrived at through talk. We are interested in more complex problems – including those that might be labelled "wicked" (e.g. those where there is not even a consensus over how to adjudicate between more and less satisfactory solutions). In such cases, talk alone will rarely suffice. Rather, the people involved in working on the problem need to construct shared representations of the problem and of candidate solutions. They need to draw upon processes of inquiry – including what we are calling analysis – to model the problem, and candidate solutions. They may need to *invent* methods of inquiry – including forms of analysis – as they go along. At the heart of this, we argue, is the process of building representations of how the learning network functions. Without a certain level of consensus on this, it is impossible for a team of people to agree on what can and should be changed.

We identify three closely coupled processes that need to be at work here:

a commitment to action,
the use of structured discussion to create a shared (even if only temporarily stabilised) conception of what action should be taken,
the production of models and representations of the nature of the problem and candidate solutions (or, more generally, of how the network functions now, and how it might work in the future).

The commitment to action is important – the people involved have a real challenge to address and are personally invested in doing something about it. This is a very different position from which to look at the world – to look at a learning network – than is the case with someone who is merely a dispassionate observer. Having "skin in the game" makes a difference to what counts as actionable knowledge. Use of "structured discussion" is also important. By this we mean that discussion is used as a tool to look for, and create, a consensus on what must be done. The third element is inquiry and model-building: the systematic use of methods for investigating relevant aspects of how the learning network functions, and creating representations that can be useful resources in the

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structured discussion. So, choices can be made about representations in terms of how they are meant to function in a structured discussion, which is (in turn) being used by a team of people who are invested in, and committed to, taking some design action.

Living on the inside, looking from the outside

The "three coupled processes" idea, outlined above, comes from the work of Ison, Blackmore and colleagues, who draw on Checkland's soft systems methodology (SSM) – see e.g. Ison & Blackmore (2014). We find these ideas particularly helpful when considering participatory design – understood as a paradigm in which people are designing for their collective good, and as a practice in which joint inquiry and structured decision-making processes are needed in order to make progress with complex, even wicked, problems.

ACAD can then be seen as a way of helping participants in a learning network converge on methods of representing important aspects of how the network is functioning, such that discussion informed by the representations they construct stands a chance of leading to beneficial action. It can be applied in broad brush ways – to create a holistic picture of epistemic, physical and social design components, emergent activity, co-configuration and outcomes (see Carvalho & Goodyear, 2014 for examples). Or it can be applied to specific areas of activity or infrastructure that are seen as being problematic. For such cases, there is an array of possibilities for representing the important details of how people, tools, activities etc. are entangled, how (re)designable components might be disentangled, and what might then be expected to happen (see, for example, Goodyear, Carvalho & Dohn, forthcoming; Yeoman, 2015).

Acknowledging that rank-and-file network members can be important, if occasional, participants in complex processes of (re)design – processes that depend upon use of such representations – helps cast new light on some disputes about participatory design and the analysis of human-material assemblages. For example, in a collection of essays about design anthropology, Gatt & Ingold (2013) advance an argument that the creativity of design is not found in "prefigured solutions to perceived environmental problems but in the capacity of inhabitants to respond with precision to the ever-changing circumstances of their lives … finding the grain of the world's becoming … [and] bending it to an evolving purpose … opening up pathways rather than setting targets" (p145). They are suspicious of accounts of design that detach it from the flux and flow of life, and that privilege processes of *a priori*, rationalistic in(ter)vention. This seems to us to be a nicely crafted depiction of how organic, emic, vernacular or insider design may take place. But we think it underestimates the complexity of the binds in which people often find themselves, and it miscasts the kinds of representations about which we have been speaking. Taking a line from Knappett (2011), we might say that representations which appear (retrospectively) to over-tidy the world into networks of neat, well-defined objects – seen as nodes linked in simple ways – are best understood as models for action not claims to truth. Ingold wants to sensitise us to the messiness and flux of the world – to lively, ill-kempt *things* linking in active *meshworks* not tidy objects in freeze-dried networks. This is fine, but we also see it as legitimate for people to use simplified representations of the world *prospectively*, in order to make sufficient shared sense of what is happening to agree on what should be done. To deny this possibility is to trap people in the world that can directly sense. What Checkland, Ison, Blackmore and others give us is a way of thinking reflexively about the use of analytic representations as tools for shared inquiry, sense-making and action – in short, tools for learning and changing the world.

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