Chapter 4
Organisational Contexts for Lifelong Learning: Individual and Collective Learning Configurations

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Introduction

The aim of this chapter is to explore certain features of lifelong learning in organisational contexts. Much effort has been devoted to understanding how individuals learn, this effort often falling into the realm of psychology. There is also a considerable literature on how organisations learn, with many studies focusing on structures and processes. The discussion that follows will examine both of these issues from the perspective of their possible interrelationships, guided in general by the broader framework of social epistemology, where the unit of epistemic agency and its dynamics includes both individuals and organisations. Attention will also be given to the ways in which organisations might scaffold the conditions for individual learning and how this scaffolding is, in turn, shaped by such learning.

Structure of Argument

The discussion flows from the very general to the rather particular. After a preliminary discussion about terminology, I illustrate some aspects of individual learning within the broad normative context of societies that learn, taking as examples the influential social epistemologies of Dewey and Popper. The main lesson from these examples is that the conditions for social learning do not necessarily require all individuals to learn.

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The focus, while still fairly general, then shifts to examples of mathematical modelling of different social epistemologies that explore, in a more fine-grained way, the structures that promote social learning and the role of individuals in these structures. Here, the emphasis is on different divisions of epistemic labour among individuals within organisations and their effects on how the organisation learns.

One feature that looms large in shaping the relationship between individual learning and organisational learning is the institutional framework in which organisations operate. I use some analyses from institutional theory to specify these matters more closely, drawing on a taxonomy of relations between institutional constraints and organisational options for autonomy. I observe that this relationship operates in both directions. That is, not only do patterns of learning among individuals contribute in various ways to learning in organisations but also organisational structures and processes shape, or scaffold, individual learning.

An analysis of these mechanisms of the institutional scaffolding of organisational cognition and learning and the organisational scaffolding of individual cognition and learning takes us closest to the particular. There are many types of relationship between these factors that can influence lifelong learning in organisational contexts. What remains useful as a general resource, however, is the tools of analysis that are currently under development in a variety of disciplines, the most recent being the link between individual cognition where individuals possess minds extended by both technological and cultural artefacts and by organisational structures and processes.

Learning and Organisations

Let us begin by drawing a number of distinctions aimed at narrowing or refining the scope of the argument. First, it is useful to distinguish two senses of ‘learning’. The first refers to the acquisition of knowledge that is already known. This is the more familiar sense of the term ‘learning’. It is more a case of knowledge transfer. The second refers to the acquisition of knowledge that was previously unknown. This is a case of knowledge creation. This chapter will be about lifelong learning in this second sense of ‘learning’. Since the application of knowledge to new domains often requires adaptation or reinterpretation, I include these applications as examples of knowledge creation.

A second distinction concerns that sometimes made between organisational learning and the learning organisation. Although usage is not always consistent in the literature – the term ‘organisational learning’ is often used generically for both cases – the former notion is said to refer primarily to individual (or group) learning that takes place within an organisation. It is about the micro features of learning within the organisation. The latter term is said to refer to learning at the macro level, concerning the whole organisation (Dahlgaard 2004). Despite my focus on the learning organisation, I shall blur this distinction somewhat by talking about individual learning within the context of a learning organisation. This is a common

approach having two main foci that match the above distinction. The first prioritises individual learning with the organisation seen primarily as the venue in which it occurs. Schools are the most obvious example. The second prioritises the learning organisation, with individual learning of secondary importance. Argyris and Schon's (1978) pioneering work on single and double-loop learning within organisations is a good example of this focus, including the strategy of explaining failures to learn by freely making use of recourse to individual pathologies.

As a final preliminary point, I want to say a little about how I am construing the epistemological structure of knowledge creation, sometimes referred to as knowledge building or theory building. The most general constraints defining this type of learning are the complexity of the social world, its particularity in relation to situations and our own bounded, or limited, rationality in all its aspects. These constraints place a premium on processes for improving or correcting our existing knowledge, commonly within the dynamic of critical analysis and testing of claims. One consequence of importance is that when it comes to understanding the dynamical aspects of knowledge in organisations, these constraints are self-referential and conspire to render our theories highly fallible, provisional and mostly context specific.

Social Epistemology: Dewey

Broadly speaking, social epistemology is the study of those social arrangements of individuals that engage in the acquisition of knowledge. It examines the conditions under which knowledge is acquired by those arrangements and the various circumstances that make it possible or make it more or less efficient. A more specific account is provided by Philip Kitcher (1993, p. 303):

> The general problem of social epistemology, as I conceive it, is to identify the properties of well-designed social systems, that is, to specify the conditions under which a group of individuals, operating according to various rules for modifying their individual practices, succeed, through their interactions, in generating a progressive sequence of consensus practices.

There are many examples of social epistemology. One of the most influential was that proposed by John Dewey, especially as espoused in the context of his work about the nature of education.

Dewey held a praxis view of knowledge, which may best be understood by contrasting it with more traditional empiricist views. For classical empiricists, such as Hume or Locke, learning occurred in individuals through a build-up of sensory impressions concatenated by virtue of the thin resources of logic. One serious limitation of this approach was that there seemed to be no way out of solipsism, the notion that a learner's knowledge was restricted to just their inventory of sensory impressions. Construed as a representational structure, knowledge was thus of the contents of their own sensory experiences, not some world that might have given rise to these sensory impressions. Dewey's theory of knowledge avoided this and other problems of classical empiricism.

For Dewey, epistemology was a method: the experimental method. Construed in terms of individual learners, this method had two dimensions:

> On the one hand, it means that we have no right to call anything knowledge except where our activity has actually produced certain physical changes in things, which agree with and confirm the conception entertained..... On the other hand, the experimental method of thinking signifies that thinking is of avail; that it is of avail in just the degree in which the anticipation of future consequences is made on the basis of thorough observation of present conditions. (Dewey 1916, p. 338)

In this method, our knowledge drives expectations of the consequences of actions that in turn validate such knowledge through confirmation by experience. The method of knowing is itself initiated by the perception of problems and the need to reach a solution, or the resolution of the tensions to which they give rise. Hence, for Dewey (1916, p. 344), 'Knowledge as an act is bringing some of our dispositions to consciousness with a view to straightening out a perplexity…' Because of this naturalistic formulation, the issue of solipsism cannot arise. It is the natural, external world that is an essential ingredient in shaping the growth of knowledge. In this sense, Dewey is a realist (Godfrey-Smith 2009).

Framed in terms of individual resource development for the solution of problems, this epistemology is quite narrow. However, Dewey addresses the issue by considering the wider social context in which individuals act, particularly in his formulation of a democratic conception of education. Here, human association can function as an epistemic resource in two distinct but complementary ways. Dewey aims to produce an account of an epistemically progressive form of human association that is both realistic in the sense of being grounded in actual practices and normative in the sense that it can embody realisable suggested improvements. The first of the two elements to his social epistemology 'signifies not only more numerous and more varied points of shared common interest, but greater reliance upon the recognition of mutual interests as a factor in social control' (Dewey 1916, p. 86). This is the 'within group' dynamic, without which individuals see fewer ways of strengthening and developing to their own viewpoint as a partially shared enterprise that builds on their interactions with interest-relative peers in that group. The second element concerns how groups in a social formation interact. It 'means not only freer interaction between social groups (once isolated so far as intention could keep up a separation) but change in social habit – its continuous readjustment through meeting the new situations produced by varied intercourse' (Dewey 1916, pp. 86–87). Herein, lies the principal source of diversity of viewpoint, with the society as a whole benefiting epistemically by this dual structure of within group focus and between group diversity. Dewey regards these two features of human association as constituting a democratic society.

Although an organisation could be construed in this social epistemology as just one group in a larger social formation, it is easy to see how the epistemology could be applied within an organisation by making certain structural adjustments. For example, a research-oriented organisation, specifically in the business of promoting the growth of knowledge, might be partitioned into a number of competing research teams. An individual's knowledge is extended both through collaboration

within the team and by exchanges of information between teams, and the organisation's knowledge grows when any team is successful in solving the problem. And once the problem is solved, individuals grow in knowledge through the sharing of this success across teams. This broadly Deweyan approach sees individual learning occurring within the context of the whole democratic society advancing its knowledge.

Social Epistemology: Kitcher

Kitcher (1990) imagines a similar example, though with an emphasis on the learning organisation, in a paper that explores possible differences between individual rationality and collective rationality when it comes to specifying the division of cognitive labour within a community of scientists located among different research teams. The difference he explores is the community advantage of having a range of competing research teams working on possible solutions to a problem versus the notion that some individual scientist will be obliged to work in research teams exploring what they believe to be less plausible theories or lines of attack. His key issue is that 'only if we situate the individual in a society of other epistemic agents….. does it begin to appear rational for someone to assign herself to the working out of ideas that she (and her colleagues) view as epistemically inferior' (Kitcher 1990, p. 8). But how, exactly? This is the nub of the problem. How may we reconcile a community optimum (CO) distribution of cognitive labour, requiring a spread of research teams with an individual rationality (IR)-based distribution of cognitive labour where everyone works on the research team that is the most promising? Kitcher considers both altruistic and non-altruistic IR alternatives. The problem is easily resolved in an altruistic model by simply defining an IR agent as one who would prefer to work in a community that maximises CO, where this is assumed to maximise 'the chances of discovering the correct answer' (Kitcher 1990, p. 14). However, Kitcher also shows how a convergence of CO and IR distributions is possible in the case of non-altruistic IR agents, where these are posited to be 'ruthless egotists'. The trick is to set a very high non-epistemic reward for success – say a Nobel prize – divided by the number of researchers in the team. The utility of combining a low probability of success with a high pay-off research programme will be sufficient to attract a modest number of IR ruthless egotists to work on it, as might be expected under a CO distribution of cognitive labour.

The pursuit of lifelong learning under these organisational arrangements is therefore tied to a mixture of both epistemic rewards – getting the right answer – and non-epistemic rewards – a chance of fame and money. (See Kitcher 1990, p. 17. For an alternative analysis, that critically discusses Kitcher's work, see Weisberg and Muldoon 2009.) In Kitcher's model, the extent of individual learning will therefore be stratified, at least initially, being more likely to take place among those individuals working on the research team with the highest probability of success. Members of other teams then will acquire this knowledge through dissemination.

Dewey's theory of knowledge and its growth within individuals led to his view of social epistemology and ultimately to a defence of a conception of democracy as an epistemic ideal. A related line of argument can be found in the work of another influential epistemologist, namely Karl Popper.

Social Epistemology: Popper

The primary focus of Popper's epistemology was on the nature and growth of scientific knowledge. In contradistinction to many writers on epistemology, Popper's approach was not formulated explicitly within a framework of how individuals come to learn what they know. When George Boole published *An Investigation of the Laws of Thought* (1854/1958), the title may have suggested, mistakenly, a reference to thought as a cognitive process. But no. In dealing with the patterns of inference and logical relations among statements, its subject matter expressed an anti-psychologism that came to completely dominate the field from Frege onwards. Logic gave a normative view of reason, whereas psychology presented a descriptive account. When it came to understanding the nature and growth of scientific knowledge, however, there was a standard bifurcation. The task of justification was a matter of logic of establishing appropriate patterns of inference. Discovery, on the other hand, was thought to involve psychology, exploring the cognitive processes, whereby illumination occurred or where new ideas suddenly materialised. Popper's great work, *The Logic of Scientific Discovery* (1959) as its title suggests, challenged this bifurcation. Psychology had no important place in discovery either. In making his case, he begins: 'I must first make clear the distinction between the *psychology of knowledge* which deals with empirical facts, and the *logic of knowledge* which is concerned with logical relations' (Popper 1959, p. 30, italics in original). In Section 2 of this work, entitled *Elimination of Psychologism*, he continues: 'As to the task of the logic of knowledge…… I shall proceed on the assumption that it consists solely in investigating the methods employed in those systematic tests to which every new idea must be subjected if it is to be seriously entertained' (Popper 1959, p. 31). Although the idea of exploring conditions under which knowledge grows, while ignoring the contribution of psychology, may seem strange, remember that we are not working with a transmission view of knowledge growth but with a view of learning things that were previously unknown.

The nature of this testing process and its associated logic is spelt out in great detail in *The Logic of Scientific Discovery*. And it has been challenged in almost every respect since publication. Nevertheless, the basic ideas, and how they lead to both a social epistemology and a powerful tool for theorising organisational learning and the role of individuals within learning organisations, are easy enough to describe. Roughly speaking, scientific knowledge is said to grow by a process of conjecture and refutation. Problems prompt tentative theories that are hypothesised to provide solutions, and then these theories are rigorously tested in a process that hopefully leads to the elimination of errors. In *Objective Knowledge* (1979, pp. 164–165), Popper gives the following schema for this process:

$$P1 \Rightarrow TT1 \Rightarrow EE1 \Rightarrow P2$$

In this schema, P1 is the original problem, TT1 is the first tentative theory up for testing, EE1 is the corresponding round of testing to eliminate errors, and P2 is any new problem that arises as a result of the process of error elimination. As it is a cyclical process, it is useful to consider each cycle as a Popper Cycle. Knowledge grows when a succession of Popper Cycles is epistemically progressive in the sense that it is deemed to terminate with a solution.

Now, regardless of the schema's status as a logic of knowledge, for it to be applied in real knowledge building situations, it needs to be instantiated in some kind of social configuration. As it turns out, something like this schema is ubiquitous in models of organisational learning, once it is recognised that the process of theory testing amounts to adjudicating the outcome of theory-driven feed-forward expectations against the feedback from experience in testing the theory. Thus, consider the single and double-loop learning models that Argyris and Schon (1978) explored in their work on organisational learning. An organisation develops, or proposes, a set of strategies and assumptions for initiating or maintaining performance at some desired state, or interval, where what is desired reflects a deeper set of organisational values or basic purposes. The performance target can be regarded as the problem, or P1, while the strategies and assumptions are the organisation's tentative theory, or TT1 that leads to particular feed-forward expectations that can then be tested against feedback from the organisations operating experience. In the case of single-loop learning, where there is a mismatch, effort goes into changing this particular narrower, TT1. Since the deeper set of organisational values and basic purposes is not up for consideration, responses to mismatches boil down to reworking implementation processes. In the case of double-loop learning, however, the tentative theory includes, for revision, the background values, basic purposes and even epistemic operating procedures.

In this sort of instantiated Popper Cycle type schema, individuals play their role within these larger epistemic organisational components. The upshot is that individual learning can be quite limited where organisational role does not extend to the full informational picture. Thus, one can be involved in an aspect of implementation that does not include access to knowledge of outcomes. Or one can monitor outcomes without being privy to how the feedback of this information is utilised. The division of epistemic labour in a learning organisation, while efficiently promoting learning at the organisational level, can be antithetical to individual learning. Here, the role of individuals in promoting learning in the organisation is analogous to the role of individuals on an assembly line putting together an automobile. No one has to know more than what their fragment of the whole process requires.

Under what conditions might an efficient social epistemology for organisations be compatible with the enhancement of individual learning? To get some purchase on this issue, we need to take a closer look at the matter of theory testing. The first point that needs to be made is that testing theories is a complex matter, owing to both the complexity of test situations and the complexity of theories. To illustrate this with a relatively simple example, Newtonian gravitational theory implied that

the planet Uranus would have a particular orbit. When careful observational evidence contradicted this predicted orbit, there were at least two broad choices available. First, the theory was falsified by observation. Or second, the mismatch between observation and prediction was the result of the gravitational influence of another, as yet unobserved planet, beyond the orbit of Uranus. When the theory was used to predict the position of this hypothesised planet, Neptune was discovered.

Since, for Popper, the growth of knowledge depends on the possibility of being able to falsify theories, the problem becomes acute when large-scale social theories are up for testing. For there are so many possible causes operating and so many hypotheses within a social theory that are simultaneously being tested that it is difficult to know what claim is being falsified by what condition. Much of *The Poverty of Historicism* (1957) is devoted to working out the implications that social complexity and unpredictability have for the growth of knowledge. In his discussion of piecemeal versus utopian social engineering, Popper argues as follows:

> The piecemeal engineer knows, like Socrates, how little he knows. He knows that we can learn only from our mistakes. Accordingly, he will make his way, step by step, carefully comparing the results expected with the results achieved, and always on the look-out for the unavoidable unwanted consequences of any reform; and he will avoid undertaking reforms of a complexity and scope which make it impossible for him to disentangle causes and effects, and to know what he is really doing (Popper 1957, p. 67).

Hence, part of maintaining the social conditions for the growth of knowledge is to engage in incremental reform that which is modest enough for its consequences to be clearly demarcated and for those consequences to be reasonably identified with the theoretically motivated actions which gave rise to them. A further part that Popper adds is to maintain the social conditions for engaging in criticism, notably those practices that permit theories to face the tribunal of evidence, and for the merits of revisions to be explored and tested. And like Dewey, Popper's social epistemology requires a democratic form of human association: 'Ultimately, progress depends very largely on political factors; on political institutions that safeguard the freedom of thought: on democracy' (Popper 1957, p. 155).

Popper's anti-psychologism notwithstanding, it is reasonable to characterise this epistemology in the language of individual and collective learning. For real, social processes requiring individual actors are the means for instantiating its operation. This being so, we can now ask how much of this can be used to underwrite recommendations for organisational structures that make for both organisational and individual learning. In the case of a society, 'the vast majority' of its institutions, rather than being consciously planned, have just grown (Popper 1957, p. 65.) But, when it comes to the design of particular organisations, we have much latitude. One organisational design that assists to reduce both organisational complexity and the problem of theory holism is modularity. Where organisational functioning is highly partitioned by a suitable division of organisational labour, the conditions that make for successful learning from experience may likewise be partitioned. Although he uses decision-making capacity rather than learning as the basic consideration for organisational design, Herbert Simon reaches a similar conclusion, at least in relation to modularity: 'the inherent limits of information-processing systems impose two requirements on

organisational design: that the totality of decision problems be factored in such a way as to minimise the interdependence of the components' (Simon 1976, p. 294). His second requirement goes further – 'that the entire system be so structured as to conserve the scarce resource, attention' (Simon 1976, p. 294) – lending itself to supporting a hierarchy that filters information to the appropriate level of decision. All of this suggests that whenever conditions exist for learning through Popper Cycles, it can occur at all levels, from individuals to large social configurations.

Much traditional work in social epistemology relied on intuitions of social functioning in order to draw conclusions, often under counterfactual circumstances, concerning how particular social relations of learning would actually operate. But in the last 20 years or so, powerful modelling techniques have been developed to simulate these processes on computers. To explore assumptions about relations between individual learners and learning organisations in a more detailed way, it is useful to look at this research on artificial organisations.

Modelling Learning Organisations

The most general mathematical tool for modelling social learning is graph theory, where a graph is a collection of nodes (or points) connected in various ways by paths (or lines). Hutchins (1995, pp. 243–262) offers an account of learning in a small artificial organisation comprised of four individuals. The individuals, in turn, are represented as containing two sets of nodes representing the hypotheses that are connected by paths in such a way as to define two different theories. These individuals are then connected by paths that link the hypothesis-representing nodes. The paths among the individuals are thus said to represent communication about hypotheses. The whole network also has an input signal signifying evidence. In this model, the issue under investigation was the role of leadership (as represented by strong signals coming from one of the individuals to the others) in shaping the organisation's decision-making capacity and its learning capacity. The key finding was that there was a trade-off between the two. Leadership tended to hasten decision-making, but it also increased confirmation bias with the leader's view possessing a higher chance of prevailing in the face of evidence to the contrary (see also Evers 2007). Conversely, to improve learning in this organisation, less leadership reduced confirmation bias, although it also reduced decision-making capacity.

In a very small artificial network, this result on the propagation of influence may have been an artefact of the network's design. However, more detailed modelling using the resources of social network theory has produced similar results. Hutchins's (1995) network architecture and its dynamics were based on neural network modelling. But, social network models are also graphs, although in that case, the nodes represent people rather than hypotheses. A considerable impetus for the mathematical study of social networks arose out of the discovery by Watts and Strogatz (1998) of 'small worlds', networks that had very interesting properties concerning the propagation and diffusion of information.

Imagine a network consisting of an array of nodes variously connected to each other by paths. This network can be described, in part, with reference to two important properties. The first is distance. This is the number of paths one can travel along to get from one node to another. The average path length expresses this for the whole network. The second is the clustering coefficient. It comes in two varieties. The local clustering coefficient for a node in an undirected network (one where the direction of the path does not matter) is the number of paths that connect it to its nearest neighbours divided by the total number of paths that could exist between these neighbours. The average clustering coefficient for a network is therefore the average of all these local clustering coefficients. A small world network is one that has the properties of a low average distance and a high average clustering coefficient (Lakomski and Evers in press.)

In a network characterised by relations of friendship, it is a small world if 'on average a person's friends are more likely to know each other than two people chosen at random' (Watts 2004, p. 77) – an effect of the large clustering coefficient – and 'it should be possible to connect two people chosen at random via a chain of only a few intermediaries' (Watts 2004, p. 77) – an effect of low average distance. So, how does the relationship between leadership and learning play out in various network designs, including small world designs?

In a recent paper, Zollman (2007) has undertaken a variety of computer simulations of network learning for a number of different network architectures. We consider two sets of his findings, the first being for three of these architectures, each containing the same number of individuals. The first network is a cycle, with each node joined by a path to only its two adjoining neighbours. The second is a wheel, which is like a cycle except that there is one node at the centre connected to all other nodes. The third is a complete graph, where every node of a cycle is connected to every other node. In doing the simulations, a trade–off, similar to the one noticed by Hutchins, was observed. The cycle was the most efficient learning configuration, followed by the wheel and then the complete graph, and this held up for networks of many different sizes. However, the speed with which the networks reached their results was the reverse. The complete graph was the fastest, followed by the wheel and then the cycle. In general, 'the trend seems to be that increased connectivity corresponds to faster but less reliable convergence' (Zollman 2007, p. 580). In terms of confirmation bias, it looks like the greater the amount of connectivity, the greater is the capacity for a strong leader or, as it is sometimes called, a Royal Family, to exert its influence. This interpretation seems to be borne out by the second set of simulations.

These simulations examined a variety of network architectures that differed primarily on degree of connectivity: five that were minimally connected and five that were strongly connected.

> An inspection of the five most reliable and five fastest networks suggests that the features of a network that make it fast and those that make it accurate are very different…. Four of the five most reliable graphs are minimally connected – that is, one cannot remove any edge without essentially making two completely separate graphs. Conversely, the five fastest graphs are highly connected…. (Zollman 2007, p. 583).

Again, the basic trade-off was one of accuracy versus speed. The most sparsely connected networks performed most robustly against error or the effects of getting locked into a false view. The comparison with Dewey's social epistemology is useful, as Zollman (2007, p. 586) concludes that where accuracy of learning is important, the sort of architecture that works best is one where there are groups of highly connected individuals, but the groups themselves are relatively sparsely connected. This is exactly the architecture of Watts' and Strogatz's (1998) small worlds (see also Lakomski and Evers in press).

In these simulations, the distinction between what the individual learns and what the organisation learns is collapsed by virtue of the way organisational learning is defined. For, roughly speaking, an organisation is said to have learned to take some action (or accept some proposition or theory) if every individual meets that condition (Zollman 2007, p. 579). Part of the justification for this is a focus on the problem of confirmation bias, which arises if we posit, as important, the learning of an elite within the organisation. However, the situation is more complex than this focus suggests.

Organisational and Institutional Constraints on Learning

In general, I think that the structures that support a learning organisation will vary according to the nature of the theories under test and the nature of the evidence that figures in these tests. For example, an organisation that is solving highly constrained or very well-structured problems can be very efficient in its learning while being hierarchical with little support for individual learning beyond the top of the hierarchy. This is especially the case where evidence is unambiguous in the sense of being interpretable in the same way by all relevant organisational actors. Single-loop learning can work. The sorts of issues that shaped Dewey's or Popper's social epistemologies will rarely go over into the design of organisations. Deweyan democratic societies have no overarching set of purposes or goals beyond providing the social infrastructure enabling citizens successfully to work out their own life plans in socially compatible ways. Most organisations have quite definite goals and purposes that extend beyond the enabling conditions of their members.

These considerations suggest a broad initial division for classifying relations between individual learning and the learning organisation: namely, those organisations whose purposes and operations are partly constituted by the exercise of judgment requiring high levels of professional autonomy, and those that are not. Consider now, for illustrative purposes, the example of a school as an organisation of the former kind. A central goal, such as providing a good education, can be not only contested by teachers as to what it means but also subject to further debate and difference over how it is achieved, and what should count as evidence for its achievement. Moreover, this kind of debate is highly theoretical, invoking recourse not just to knowledge of techniques of teaching, that is, knowledge relevant only to the classroom, but also to knowledge that expresses an extended view of teacher professionalism, drawing on accounts of the nature of education, good educational

outcomes, worthwhile knowledge, student autonomy, the social relations of learning and a host of other matters. (For an overview of issues and their relevance to conceptions of good education, see Biesta (2010).) Under these conditions of ambiguity and recourse to professional judgment, the most appropriate structure for promoting learning in this school would be more like a 'small world' organisation with a good distribution of leadership among teachers, high levels of individual learning and good communication and shared decision-making between the various clusters of teachers in the organisation. (see Silins and Mulford (2002, 2004), for a view of schools as learning organisations.)

However, schools (and other organisations) exist in an institutional framework that has implications for how they operate. One motivation for the development of institutional theory was because organisations did not seem to fit the model of a rational system, that is, one that selected the best means for achieving desired goals. Organisations also seemed to function as natural systems, expressed as behaviours concerned with flourishing in the prevailing wider environment. (For more in institutional theory, see Hanson (2001) and Burch (2007).) A simple example of this conflict can be seen among organisations that manufacture computer keyboards. For historical reasons entirely unconnected to today's technology, the QWERTY keyboard, which is the least efficient design, dominates English language versions. But to deviate from this design, given prevailing skills and practices would cost market share. The manufacturer would fail to flourish in the wider institutional setting.

Now consider a common institutional framework in which our hypothesised school operates. At system level, we may suppose that there are accountability requirements, perhaps concerning student achievements, and, where schools are hypothesised to operate in an educational market, these accountability measures may be public. In stepping outside the discourse of teachers' extended professionalism, the major casualties are, first, a nuanced understanding of the learning and teaching environment of the school, and second, a detailed understanding of each student's achievements that are educationally important as the professionals see matters. One of the tensions that can arise when the work of a small world community of teachers is being evaluated on outcomes that have been formulated to meet institutional requirements where data have been de-professionalised and simplified for the wider market audience is that between relatively flat organisational structures of autonomously operating professionals on the one hand and the more hierarchical structures made possible by the informational currency of disambiguated, a-professional data on the other. In this way, institutional pressures for accountability can, perversely, narrow the scope of individual learning and increase recourse to leadership control into previously autonomous domains of individual judgment.

There has been much analysis of this kind of shifting emphasis in institutional constraints on organisations and its effects on individual organisational actors. Wider analyses, such as critiques of neoliberal reforms of public sector management, clearly apply to more than schools. (For an overview, see Fusarelli and Johnson (2004).) And for analyses that both include and extend beyond the public sector, a four-fold taxonomy based on two organisational and two institutional factors can be employed. This 'New Institutionalism' partitions organisational

environments into those that are technically weak and technically strong and institutional environments into those that demand weak or strong conformity (Rowan and Miskel 1999, pp. 364–365.) The matter of degree of conformity is clear enough. Examples of weak institutional conformity would be the many cases of businesses producing commodities, such as supermarket items, or services, such as hairdressing, for a competitive market. Hospitals, on the other hand, operate in a strong conformity institutional environment. When it comes to the matter of technicality, however, the issue is more complex. The idea seems to be that technical strength is a matter of being able to closely specify criteria for efficient (and effective) job performance and, ultimately, organisational performance. Thus, hospitals, and some businesses, are classified as technically strong, whereas schools, because of their 'uncertain technologies', are deemed to be technically weak (Rowan and Miskel 1999, pp. 364–365).

Now if we overlay this modestly specified sense of technicality with an epistemic reading, there will be some organisations whose weak technicality is due to the highly context-sensitive nature of what counts as good individual performance, and a heavy reliance on excellence in professional judgment, rather than some useful algorithm, for how to act appropriately in those contexts. With this reading in mind, we can use the four-fold taxonomy of this version of institutional theory to extend our exploration of the various relations between individual learning and the learning organisation and the kind of structures that support the latter. For three of the four possibilities, one can readily construct coherent relations between the individual and the organisation when it comes to the dynamics of learning. The fourth possibility is the example under discussion where institutional strong conformity fails to cohere with the epistemic openness of weak organisational technicality.

Organisational Scaffolding of the Mind

What this possibility raises is the more general question of the role of organisational arrangements in scaffolding the mind. There are many ways that individual minds can be extended, or scaffolded, by artefacts, technological and cultural. An apparatus such as an abacus greatly extends the mind's capacity for calculation through the ordered manipulation of arrays of beads. Representing numbers in Arabic numerals rather than in Roman numerals greatly extends algorithmic facility for basic arithmetic operations such as multiplication and division, as Arabic number operations can be expressed in compositionally decomposable pattern completion tasks. (See Clark 2001, pp. 140–159, for a useful discussion of cognitive technology.) Social arrangements can also scaffold cognition, including where the unit of analysis is the organisation that learns. For example, the institutional arrangements posited for the original Caldwell and Spinks model of school-based management required schools to (1) develop charters that expressed a modest number of priority school goals to be achieved over the 3 year life of the charter; (2) develop implementation strategies that were to be reviewed annually; (3) use

feedback from reviews to modify these implementation strategies where necessary and (4) review the accomplishment of charter goals in the light of end result feedback (Caldwell and Spinks 1988). Supported by an extended sense of teacher professionalism, this arrangement could produce a coherent combination of individual and organisational learning.

In a Deweyan democracy, with weak institutional conformity mandating merely liberty, freedom from interference and some egalitarian distribution of human development infrastructure, a similar coherence between individual and social learning could result, although this would depend on learning arrangements, arguably weakly technical, within socially distributed clusters of people with common interests. To say something more explicit about the institutional environments that would favour learning organisations that in turn may scaffold (or not) individual learning, we need to move to a more fine-grained analysis than that provided by the categories of current social epistemology and the new institutional theory.

Some preliminary findings on this issue can be found in the work of Andy Clark in his study of the biotechnology industry (Clark 1999). For analysing the epistemic and cognitive dynamics and architectures of this particular industry, a range of new concepts are required, drawn from the theory of complex adaptive systems, to augment more familiar ones. For starters, complex adaptive systems are characterised as self-organising aggregations and are soft-assembled. Self-organisation is a form of aggregation of individuals and their interactions that 'yield a distinctive collective effect, and in which the relevant interactions are not controlled and orchestrated by any distinct overseeing element' (Clark 1999, p. 47). Soft assembly is a matter of taking advantage of existing internal and external structures for accomplishing tasks. Relations between the institutional and wider environment on the one hand and the trajectory pursued by the biotechnology organisation on the other means that 'instead of seeing the environment as simply a source of problems and an arena in which problem-solving processes are played out, it becomes necessary to view aspects of the environment as equal partners in extended, soft-assembled, problem-solving' (Clark 1999, p. 48). Clark then further specifies the nature of the industry as operating in a high-uncertainty market where its processes are research intensive utilising high-technology.

Given such an institutional and organisational set of constraints, it is possible to argue for certain types of organisational scaffoldings that support both individual and organisational learning. In particular, organisations within this industry typically make use of: (1) 'minimal hierarchical structures' both within organisations and between venturing partners; (2) focus on the development of individuals' specialised skills that lead the organisation to articulate in complementary ways with other relevant organisations; and (3) exploit corporate architectures that enable the organisation to easily extend itself by permitting high levels of interaction with external resources (Clark 1999, p. 52). Despite the possibility of being able to mount quite detailed arguments for these arrangements that link epistemic considerations with the realities of a particular commercial market, the point that needs emphasising is the particularity of the example or, indeed, just about any example.

Conclusion

The study of lifelong learning in organisational settings is complex. At the most, general level is the study of knowledge building in society-wide social formations of the sort that Dewey's social epistemology dealt with. There are plenty of large issues at this level. One currently being discussed is whether China can sustain internationally competitive growth while maintaining a rigid distinction between economic freedom and political freedom. If economic growth depends on the development of knowledge industries, then as Friedman (2010) argues, 'knowledge industries are all being built on social networks that enable open collaboration, the free sharing of ideas and the formation of productive relationships – both within companies and around the globe'.

Within particular social formations, institutional constraints are defined for various organisations, and these shape in particular ways the nature of both individual learning and the prospects for learning organisations. Although it was possible, using institutional theory to discern a number of conditions at individual and organisational levels that shaped prospects for learning in each and relations among each in their interaction spaces, a more detailed causal story looked like it would require the resources of both a view of individual learning and cognition as occurring in an extended mind, and an account of how organisational structures and processes operate to scaffold that mind. On this matter, I let Andy Clark have the last word.

> The study of these interaction spaces is not easy, and depends both on new multidisciplinary alliances and new forms of modelling analysis. The pay-off, however, could be spectacular: nothing less than a new kind of cognitive scientific collaboration involving neuroscience, physiology, and social, cultural, and technological studies in about equal measure (Clark 2001, p. 154).

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