Learning and Metaphors

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Let us start with what I think is a surprising, but not widely recognised, fact about learning, namely that humans seem to be unable to think about learning without employing metaphors of some kind. Precisely why the use of metaphors is inescapable when we try to understand learning is a complex matter that is well beyond the scope of this paper. (For some suggestive ideas on this matter see Lakoff and Johnson 1980, 1999; Murdoch 1997. See also Hager 2004a).

Let me remind you of what exactly a metaphor is. According to the *Oxford Companion to English Literature*, metaphor can be thought of as "the transfer of a name or descriptive term to an object different from, but analogous to, that to which it is properly applicable, e.g. 'abysmal ignorance'". (The related notion of analogy is, of course, concerned with "likeness in certain respects"). Scheffler (1960, p. 48ff), in an early insightful discussion of the centrality of metaphorical language in educational writing, including writing about learning, noted that metaphors indicate

> that there is an important analogy between two things, without saying explicitly in what the analogy consists. Now, every two things are analogous in some respect, but not every such respect is important.... the notion of importance varies with the situation.....

Scheffler added that every metaphor has limitations, "points at which the analogies it indicates break down" (1960, p. 48). For dominant metaphors, he suggested that we need to determine their limitations, thereby "opening up fresh possibilities of thought and action." (Scheffler 1960, p. 49). The limitations that flow from employing metaphors, especially the respects in which the two things are not alike, is an important theme in what follows.

The 'common-sense' understanding of learning: acquisition and transfer

We can illustrate how thought about learning is immersed in metaphors by considering how learning is commonly understood. There is a widely accepted, 'common-sense' story about learning that goes something like the following (Hager 2005a). The most desirable learning is located in individual minds (not bodies); such learning centres on factual statements (or propositions) (true, false; more certain, less certain); these propositions are available for ready recall by the minds that have acquired them. So learning involves the furnishing of minds with appropriate arrays of propositions (knowledge). Once acquired, learning can be transferred (applied), via our bodies, to alter the external world.

Bereiter (2002) dubs this 'common-sense' story the 'folk theory' of learning. It views the mind as a 'container' and 'knowledge as a type of substance' that is placed in the

container. Thus, it is widely accepted that learning is 'adding more substance' to the mind thought of as being a kind of container.

> Under the influence of the mind-as-container metaphor, knowledge is treated as consisting of objects contained in individual minds, something like the contents of mental filing cabinets. (Bereiter 2002, p. 179)

This 'common-sense' story involves several metaphors. The prime metaphor is the notion of *acquisition*, which is invariably accompanied by the associated metaphor of *transfer*. Thus, the acquisition and transfer metaphors dominate popular thinking about learning. This is, perhaps, unsurprising, given that formal education has been compulsory for well over a century, so that the public has been well and truly 'schooled' to accept that learning of propositional knowledge is the 'natural' kind of learning. Pen-and-paper or oral testing situations have been the ubiquitous means to find out what level of learning a student has attained (*acquisition* metaphor). If learning has been successful, the student will be able to reproduce it (*transfer* metaphor) in the test situation.

The 'common-sense' story about learning probably underpins the public perception that successful performance in quiz shows is a good measure of learning. This perception of quiz show performance involves a series of associated assumptions, each of which can be related closely to the acquisition and transfer metaphors:

- All questions have a correct answer.
- The height of learning attainment is to be able to answer all questions.
- The degree of learning can be accurately quantified (e.g., as % of correct answers).

Now you might think that professional educators are much more sophisticated than this. We don't really think that the mind is a container. Nor do we think that all questions have a single correct answer. Do we? But, I maintain, there are crucial elements of this 'common-sense' story that continue to shape thinking about learning and assessment in educational systems and policy documents. Formal education systems have, of course, traditionally been closely aligned with the learning of propositional knowledge. Propositional learning has dominated curriculum at all levels to the extent that it has been regarded as the highest form of learning. Thus the general implication has been that able students should focus on traditional theoretical disciplines and that less able students should combine more elementary versions of these disciplines with the study of more practical and applied subjects. Likewise educational assessment has been dominated by a focus on assessing propositional learning, partly because reliance on the various kinds of pen-and-paper tests that cater most readily for assessing propositional learning is more economical than the alternatives.

However, when I say that there are crucial elements of the 'common-sense' story that continue to dominate thinking about learning and assessment, I am thinking of *even more fundamental assumptions about learning* that we take over from this story. Assumptions such as 'What is learnt is an independent thing or substance'. Since individual learners supposedly acquire and contain this thing or substance (i.e. learning), then 'Learning is a kind of thing inside of learners'. Also, since learners can apply or transfer their learning,

another fundamental assumption is that 'There is movement of this thing or substance (learning) from place to place'. So learning as a thing has a clear independence both of the learner and of the contexts in which it is acquired and applied.

There is also a skill learning equivalent of the 'common-sense' story about learning. In many respects its assumptions parallel the furnishing of minds with statements (or propositions) story, but its distinctiveness lies in its focus is on skills instead of statements. Skills are viewed as things that somehow lodge in the learner's body (or, better, psychomotor system). Once again, what is learnt is an independent thing or substance. This is captured in popular discourse about skills, e.g. 'gaining skills', 'passing skills on from one generation to the next', 'either use them or you lose them'. (The notion of disuse producing decay over time also applies, of course, to propositional learning). That skills are independent of the learner is suggested by the fact that different learners can all acquire the same skill. Skill learning, like theoretical learning, supposedly involves literal movement of the learnt thing or substance from place to place (e.g. transfer of a skill from worksite A to worksite B). Also, skills are thought of as separate from and independent of the context in which they are learned. The widespread acceptance of this assumption is evident from the current enthusiasm for generic skills. As nations have sought to respond to globalisation by enriching, expanding and better recognising the skills profiles of their labour force, policies to promote and reward so-called 'generic skills', such as employability skills, key skills, and learning to learn skills have become common at all levels of education systems (see, e.g., Hager & Holland 2006).

Another example of the power of this story of skill learning and its associated metaphors is provided by what I call naïve competence policies. Much vocational education is premised on prescribed sets of competencies or skills that individuals need to acquire in training courses (see Hager 2004b). Having acquired them, individuals are certified as 'competent', and go out and transfer or apply these competencies to any job within their occupational field. Naturally, employers have been very attracted by the notion of recruits who are fully productive from day one. Unfortunately, these high hopes have proved to be misplaced (Hager and Smith 2004) largely because, even in very standardised occupations, workplace competence requires significant contextual learning.

The most basic kinds of performance assessment focus on testing individual skills along these lines (including instances in medical education). Centring testing on individuals seems right because of the assumption that learning is inside of the individual. With this assumption, group learning seems to be a possibility only in very limited senses. For instance a group of learners might all learn the same skill. In which case, we might say that the group possesses the particular skill. But this is a very limited sense of 'group learning'. Employing the acquisition and transfer metaphors rules out the possibility of group learning except as a sum of what is inside of the respective individuals. If the assumption that learning is located inside the learner is dropped, richer notions of group learning become viable, as will be demonstrated later in the paper.

Limitations of the acquisition and transfer metaphors

Problems arise from taking transfer and acquisition too literally as key notions to characterise learning. In fact, being metaphors, they have inevitable limitations. We will examine these briefly.

Let us begin with problems surrounding the acquisition metaphor. In thought and talk about learning, acquisition though supposedly employed in its normal everyday sense, is actually used somewhat differently. We take it that when someone acquires and thereby possesses learning, that what they have learnt is inside of them (in their mind/brain for propositional learning; inside of their body for skill learning). But this is not normally so for acquisition and possession. We can acquire and possess such things as a car, a block of land, or a wine collection. But none of these possessions are thereby located inside of us. So why should acquisition and possession of knowledge or skills be any different? Certainly, recent work in neuroscience challenges the cosy, mutually supportive consistency that the 'common-sense' understanding of learning posits between the acquisition, possession and transfer metaphors and the idea that learning is located in the head. Bennett and Hacker (2003) illuminate the conceptual confusions that become apparent if the findings of neuroscience are placed against 'common-sense' accounts of minds and learning. For instance, Bennett and Hacker, point out that it is simply wrong to think that knowledge and information can be recorded in the brain in the same way that they can be recorded in books, card-indexes and computers. Regarding knowledge they state:

> We may say of a book that it contains all the knowledge of a lifetime's work of a scholar, or of a filing cabinet that it contains all the available knowledge, duly card-indexed, about Julius Caesar. This means that the pages of the book or the cards in the filing cabinet have written on them *expressions* of a large number of known truths. In this sense, the brain *contains* no knowledge whatsoever. There are no symbols in the brain that by their array express a single proposition, let alone a proposition that is known to be true. Of course, in this sense a human being *contains* no knowledge either. To possess knowledge is not to contain knowledge.
> (Bennett & Hacker 2003, pp. 152-3)

So even if learners do possess their learning, to think that they contain it is to read too much into the metaphors. Bennett and Hacker then argue that similar considerations apply to the notion that information can be recorded in the brain:

> A great deal of information is contained in the *Encyclopaedia Britannica*. In that sense, there is none in the brain. Much information can be *derived* from a slice through a tree trunk or from a geological specimen – and so too from PET and fMRI scans of the brain's activities. But this is *not* information that the brain *has*. Nor is it *written in* the brain, let alone in the 'language of the brain', any more than dendrochronological information about the severity of winters in the 1930s is written in the tree trunk in arboreal patois.
> (Bennett & Hacker 2003, pp. 153).

So the commonly accepted idea that in propositional learning propositions are transferred to the mind or brain is dubious. *A fortiori*, it is even more dubious to try to locate the many and diverse kinds of human learning within the cranium.

There are also problems with the transfer metaphor. It proves on close inspection to involve puzzling oddities. In the normal usage of the term, to transfer something or someone is to convey, remove, or hand them over to a new place or position. To be transferred is literally to leave place or position A and go to place or position B. So property, say, is transferred (conveyed) from a previous owner to a new owner. A footballer is transferred from one football club to another. But in this sense it is clearly untrue that to teach skills is to transfer them. Teachers do not literally transfer their skills to learners. Rather, as a result of successful teaching, a new instance of the skill is created, seemingly in the learner's body. But the teacher still retains the skill that has been supposedly 'transferred' to the learner. So this is definitely not transfer in the usual sense. The metaphor misleads us.

An apparently simpler case is transfer of skills from place to place. We learn (say) 'x' in location 'y'. We then take it to location 'z' and use it (transfer it). But once again this is an odd usage of 'transfer'. Surely when we use the learnt skill it is more accurate to say that we apply it to the new situation. If we literally transferred it, we would leave it behind when we left the new situation. It is closer to the facts to say that it is persons having skills who transfer from place to place rather the skills themselves transferring. Once again, the metaphor can easily mislead us.

Educational arguments against the acquisition and transfer metaphors

Not surprisingly, given these limitations of the acquisition and transfer metaphors in common speech, they also run into problems when the educational issues they cover are considered more closely. Consider first the acquisition metaphor. A link has already been noted between the 'common-sense' story about learning and the perception that successful performance on a quiz show is a good measure of learning (acquisition). However, it does not take much thought to realise that the quiz show view of learning is a very limited and partial one. Consider, for example, a discipline such as chemistry, which is replete with factual propositional knowledge. There are literally millions of chemical compounds each with their own formula, colour, boiling point, melting point, freezing point, etc. These millions of chemical compounds fall into a huge number of classes, each with distinctive properties and types of reactions they take part in. Now suppose that someone became a quiz show champion by unfailingly answering correctly whatever factual questions on chemistry were asked of them, no matter how difficult or obscure the questions might be. Would we describe that person as an expert chemist? At the very least we would have some doubts about the kind of person who would furnish their mind with such minutiae. Expert chemists certainly do not fill their minds with this multiplicity of facts. Rather, they know what factual information may be useful in a given situation, where and how to access this information as needed, how to use it in suitable situations, etc. So their understanding (*not* acquisition) of the immensity of chemical knowledge is contingent on a range of know how that is not itself purely chemical nor codifiable as a

series of true propositions. For this reason, expert chemists might not perform as well as expected in a quiz show on the subject area 'chemistry', especially if the questions were pitched at a level significantly beyond the elementary.

If the knowledge of an expert chemist does not conform very well to the quiz show ideal, this is even more so for experts in more applied fields of practice. Consider an artistic example. Imagine a quiz show champion whose special subject was 'Verdi operas'. This person has an encyclopaedic knowledge of plot and scene details, names of characters, details of first performances, singers who performed particular roles, etc. But was this person really an expert on Verdi operas? From the evidence of the knowledge displayed on the quiz show we cannot really tell whether this person appreciates and is moved by performances of Verdi operas. Certainly specialists on performance of Verdi operas have quite other learning and knowledge than that required by the quiz show. Whereas the quiz show can only deal with questions where there is an indisputably correct answer, the practice of performance of Verdi operas is one in which important matters are very much open to interpretation and contestation. Different opera directors will have varying interpretations and approaches to performance of Verdi operas. Questions like 'who were the three greatest Verdi tenors?' do not have clear-cut answers precisely because different people have different background assumptions, beliefs and experiences which reflect their responses to such questions. In a word, the 'contexts', which have shaped their approaches to such questions, differ markedly.

There are also some very powerful educational arguments that challenge the value of the transfer metaphor. For a start identifying genuine cases of learning transfer has proved to be surprisingly elusive. Despite increasing power of experimental techniques, transfer "seems to vanish when experimenters try to pin it down" (Schoenfeld 1999, p. 7). In a recent major study of transfer, Haskell (2001) states the following:

> Transfer of learning … is the very foundation of learning, thinking and problem solving (p. xiii).

Yet later, on the same page, Haskell also observes that:

> Despite the importance of transfer of learning, research findings over the past nine decades clearly show that as individuals, and as educational institutions, we have failed to achieve transfer of learning at any significant level (p xiii).

If both these statements were true, it would follow that humankind was still largely incapable of learning, thinking or problem solving. Yet our everyday experiences and the history of human progress suggest the opposite is true. Something is clearly wrong here. Yet Haskell accepts this contradictory situation and retains his faith in the vital importance of transfer. This illustrates the ongoing power of this idea to shape thinking about education policy at all levels. However, given these empirical findings about transfer, others have accepted that there is a need to reconceptualise transfer and, by implication, learning. For instance, Bransford & Schwartz (1999) propose that we broaden the notion of 'transfer' by including an emphasis on 'preparation for future

learning', the ability to learn in new environments. Others, myself included, see the moral of the contradiction noted by Haskell as being the urgent need to develop new understandings of learning. This includes the deployment of new metaphors, since I accept that humans are unable to think about learning in non-metaphorical ways.

Alternative approaches to understanding learning

In the last twenty or so years, a range of theorising about learning has sought to take account of its social and situated character. This theorising has also deliberately encompassed learning outside of formal education settings. The diversity of both this theorising and the cases of learning that it encompasses, suggest that there may be no such thing as a single general account of learning. Also, that there may be many inherently different kinds of learning. As a result of this work, it seems plausible to view learning as a conceptual and linguistic construction, one that is widely used in many societies and cultures, but with very different meanings, which are at least partly contradictory and contested. Put differently, there is no external, reified entity that is 'learning'. Rather, people construct and label certain processes/activities/products as 'learning' (Saljö 2003). In these theories, the ideas that 'learning is a reified thing' and 'individuals are the main or only locations of learning' are both rejected. These newer learning theories include situated learning, socio-cultural activity theory, cognitive apprenticeship, and more. Here I will not attempt a separate account of each category of theory, as that is a lengthy and complex task (see Hager 2005b for a critical overview of these theories as they relate to understanding learning at work). Rather, I will discuss the various alternative metaphors that are employed by these newer theories and how our understanding of learning is creatively changed by these alternative metaphors. The metaphors that are invoked by these newer learning theories tend to be employed across theories, rather than a particular metaphor being distinctly associated with just one theory. The main metaphors, which I will be discussing here are: *participation*, *construction*/*re-construction* (or *transformation*), and *becoming*.

The participation metaphor

The metaphor of learning through *participation* in human practices was popularised through the seminal work of Lave and Wenger (1991). Their proposal that learning arises from learners participating in communities of practice is also referred to as *situated* learning, since, contra the 'common-sense' view of learning, it maintains that learning is highly contextual. On this approach, learning, both as a process and as a product, is inseparable from the socio-cultural setting in which it occurs. Subsequently, the participation metaphor has become widely-used, even by theorists whose ideas in other respects part company with Lave and Wenger. Thus *participation* is now a dominant metaphor in diverse writings about learning. Subsidiary metaphors found in these writings include learning as *activity* and, for learning by beginners, ideas such as 'finding your way around' the field of practice and terms that denote either level of attainment (e.g. 'second year apprentice', 'journeyman') or level of acceptance within the community of practitioners (e.g. 'legitimate peripheral participation' (Lave & Wenger 1991)).

The participation and related metaphors lead to a very different understanding of learning from that captured via the metaphors of the 'common-sense' account. What is learnt becomes a complex social construction that subsumes the individual learner. So, rather than the thing or substance of the 'common-sense' view, on this account what is learnt is a complex entity extending well beyond the learner; it is a set of more or less complex practices; a social construction undergoing continuous change. The learner is claimed to learn by active participation in social practices and is thought of as gradually being subsumed into the complex social construction that is an evolving set of practices. Here learning is not seen as independent from the learner in the particular ways that it was for the 'common-sense' view. However, the practices themselves will have a history that is not dependent on the participation of any given learner. Not only is learning on this account not located fully within the learner, but communities of practice feature the possibility, indeed the likelihood, of communal learning, i.e. learning by teams and organisations that is not simply reducible to individual learning (Toulmin 1999).

Learning for newcomers involves movement of the learner from insignificance to greater prominence as they engage in the practice to be learnt. Whereas the 'common-sense' view posited movement of what was learnt, the participation metaphor suggests movement by the learner rather than by what is learnt. The practice is normally something that is 'there' well before learners start to engage in it. Learners move within the practice from novices to, mostly, proficient performers; from legitimate peripheral to full participation. However, within theories that employ the participation metaphor, the learning of newcomers is not always the prime focus. Wenger (1998), for example, came to see legitimate peripheral participation as a special case. After all, experienced practitioners also need to learn from their ongoing participation in evolving practices.

The participation metaphor portrays learning as inherently contextual, thus directly challenging the value of the acquisition and transfer metaphors. Acceptance of the idea that learning has contextual features entails the likelihood of the learner modifying and adapting earlier learning to handle a related situation in a new context. This is a normal occurrence in all kinds of human practices. It is also a much more complex situation than the 'acquire it and transfer it' model takes it to be. This contextualisation of learning contrasts sharply with the 'common-sense' view that learning transcends context. Moreover, for the participation metaphor, learning (and the learner) continue to change as contexts change. This is why the participation metaphor highlights the ongoing learning of experienced practitioners, rather than just that of novices, as in the early work of Lave and Wenger. Overall, this makes learning a more complex phenomenon than the 'common-sense' view would have it. As already indicated, both learning by individuals and learning by teams or groups are compatible with the participation metaphor.

Limitations of the participation metaphor

The participation metaphor has been charged with embedding the learning so completely within the given context that it is remains a mystery exactly how individuals are reshaped (another metaphor) by their learning. It has been argued that participation theories are

silent about the individual's learning as their personal identity changes from a novice to a full participant (see, e.g., Elkjaer 2003, Guile & Young 1999). In integrating the individual learner into a social participatory process, the sense of the individual life history, dispositions and agency of each learner is lost (Billett 2001; Hodkinson & Hodkinson 2004b).

Another problem is that much theorising that employs the participation metaphor concentrates upon a single context for learning. Most research studies focus on learning within one workplace. The more the focus switches to the learning of experienced workers, the greater is the tendency to bracket off what happened in previous locations, or what might happen in future ones. The participation metaphor has relatively little to say about the effect of previous learning on current learning, or of past or present learning on future learning.

By emphasising the role of contextuality, the participation metaphor challenges the 'common-sense' view's assumptions about uniformity in what is to be learnt. Rather than thinking of learning for a designated practice as a standard list of items to be acquired by all would-be practitioners, a person's practice is better viewed as participation in a continually evolving process. The constant appearance of novel situations, new kinds of equipment, local traditions or preferences, etc., mean that learning needed for successful practice is continuous and not specifiable in advance. Proficiency in a particular area of practice, may not easily translate to proficiency in neighbouring areas of practice. In circumstances such as these, where learning (participation) is a continually evolving process, transfer and acquisition no longer appeal as general explanatory concepts.

I maintain that all human learning entails participation in a social context, even if that context is a desert island, or preparing for a quiz show. However, this is not the same as claiming that the participation metaphor alone can adequately explain all learning. More specifically, it cannot offer a complete explanation of all learning for all purposes. (Although Sfard (1998) thinks, controversially, that between them acquisition and participation can do the full job).

The construction/re-construction (or transformation) metaphors

This group of metaphors involves the *re-construction* or *transformation* of either the learner(s) or of the learner(s) together with their environment. This results in at least two variations within this kind of theorising. Firstly, there is the intellectual movement sometimes termed simply *constructivism*. Here the emphasis is firmly on transformation or reconstruction within the individual learner. Perhaps because of the impact of constructivism within the fields of mathematics and science education, there is often a concentration on propositional knowledge. According to this particular variety of constructivism, learning science, say, entails the transformation and reconstruction of what is already known by the learner. Thus, Chinn and Brewer (1993) write about the ways in which pre-existing schemata can inhibit the understanding of science. Subsidiary metaphors prominent in this variant of constructivism include 'scaffolding' – the notion

that new learning is built on existing understanding, as bricks are added to an existing wall. The learner is transformed into a scientist, as a wall is transformed into a building. This metaphor suggests that what is learned is changing continually, as each learner constructs/re-constructs their own evolving understanding of it. In this respect it is similar to the learning through participation metaphor. However, this version of constructivism differs from the participation approach in that it downplays the significance of context for learning. In this variation of construction/re-construction, the individual changes while the context remains the same. Put differently, there is an acknowledged influence of context on learning, but not vice versa. But even within individual constructivism, there are more or less radical versions. More radical versions portray what is learned as differing across individuals, as each learner constructs their own unique understanding of science. In less radical versions, much important knowledge, such as the content of science, remains relatively unchanged (Phillips 1995). The issue then is simply how individual students can be assisted to construct the same, i.e. the correct, understanding.

A second major variant of learning viewed as construction/re-construction (or transformation) shifts attention to holistic learning systems, i.e learner(s) together with the environment become the unit of analysis. A key idea for these versions of the metaphor is that "collective entities can learn" (Salomon & Perkins 1998, p. 10). Salomon and Perkins suggest that this kind of learning has been relatively neglected because it is not prominent in formal education settings. However, they maintain, not only does "a great deal of individual learning and education" occur outside of formal education arrangements, but that a lot of it is group learning. These versions of the construction/re-construction (or transformation) metaphors are to be found in Engestrom's (2001) version of socio-cultural activity theory. The focus here is on the activity system as a whole – it is the system that changes, usually as a result of either internal or external contradictions or pressures. The context in which individual learners work and learn is regarded as changing, and they in turn change with it. However, the emphasis is mainly on the impact that a changing context has on individual learners, rather than the other way around.

Fundamental assumptions underpinning this approach to understanding learning and its associated metaphors are:

1. Learning, is a complex relational web that transcends the individual learner.
2. Learning is an evolving process that includes the learner evolving.
3. Learning involves emergence of novelty as new understandings and/or new contexts are formed.

A limitation is that very little of the literature adopting this approach addresses both individual change and the changing context. Learning is viewed as a relational complex with individual interpretations still possible. But group learning emerges as a major kind of learning on this approach.

The becoming metaphor

This metaphor puts the individual learner back into the frame. But the person is not viewed as a 'vessel' containing 'stuff', to use Bereiter's (2002) folk theory terminology. Rather, we have a person whose social and embodied self includes skills, knowledge and understanding. These can be understood as integral parts of the person. Each person has constructed that skill or knowledge as part of themselves. Here learning is viewed as a relational web, a process of ongoing change. It connects the learner to the surrounding world in an evolving way. Learning is transactional in that it changes both the learner and the context, viewed both widely and narrowly. Most generally, learning is a change in both the learner and its environment. It follows that when a person joins a new workplace they bring within themselves much more than skills or knowledge. Rather, they bring experience.

In common with the two previous metaphor groups, this view rejects basic assumptions of the 'common-sense' story of learning. It replaces them as follows:
  i. Far from being a thing or substance, learning is a changing relational web.
  ii. Nor is learning independent of the learner, since the learner is a part of this changing relational web.
  iii. Rather than involving movement of a thing or substance from place to place, learning consists of a relational web in a process of ongoing change.
  iv. Rather than what is learnt being separate from and independent of the context in which it is learnt, learning is inherently part of and shaped by its context.

What has been presented so far, in the last two paragraphs, has much in common with the ideas characterising the two previous metaphor groups. This reflects the fact that the 'becoming' metaphor is a recently emerging one in which writers have sought to redress some of the perceived limitations of the participation and construction/re-construction metaphors. The metaphor of learning as becoming presents us with a holistic way of understanding learning as a process. This involves viewing learning as social and embodied (practical, physical and emotional, as well as cognitive). So, when a learner constructs or reconstructs knowledge or skills, they are also reconstructing themselves. This personal reconstruction should not be thought of in merely individual terms. It is crucial to fully recognise the social and embodied nature of that reconstruction. Such personal reconstruction is sometimes explicit and agentic, but much of it is tacit from the perspective of the person concerned (see Beckett & Hager 2002; Hager & Halliday 2006). That is, people become through learning and learn through becoming whether they wish to do so or not, and whether they are aware of the process or not. So the metaphor of becoming adds extra dimensions to our understanding, providing a richness that the two previous metaphor groups lacked.

Using the metaphor of becoming to understand learning does not entail a fixed state of having become. Put differently, there is not always a clear endpoint to learning, though sometimes, of course, either the learner or others may be explicitly concerned with one. Employers are often concerned with how well and, increasingly, how quickly a new worker becomes fully functional within their working practices. Similarly, students are directly concerned to become a teacher, social worker, chef, shop worker or engineer. However, such end points are simplifications and also are somewhat arbitrary stages in

the on-going learning process. It is well known that fully trained 'full members' of a workplace culture continue to learn (see Hodkinson & Hodkinson 2004a, 2004b, for one example). The metaphor of becoming captures this sense that learning is never complete. As Saljö (2003, p. 315) argues "people simply cannot avoid learning". Learning as becoming ends with death, or with a permanently comatose state. It is for this reason that it is difficult to identify when learning to be, say, a medical practitioner starts or ends. It often starts well before any formal educational training, and ends well after the first appointment to an internship.

What has been said so far about learning as becoming can be read exclusively in terms of the learning by individuals. This metaphor is certainly very useful for thinking about learning by individuals, but that should not obscure the vital importance of group learning. The idea of group learning, with no clear endpoint to the learning, is a powerful one for understanding the practices that obtain in many contemporary work and other situations. My own recent research has identified many clear instances where the concept of learning by groups is essential for any cogent understanding of what was taking place in particular work sites. In these cases, learning by individuals was but a part of the story. This research has included studies of young players being mentored into the role of 'professional orchestral musician'(Johnson & Hager 2006) and novice chefs being inducted into the practices of high performance kitchens (Johnson & Hager 2007). In both of these cases, the individuals concerned underwent some rich and rapid personal learning. But in addition, it was equally clear that what was occurring in these high performance work activities was major learning by the group or sub-groups (the orchestra as a whole, particular sub-sections of the orchestra) or teams (kitchen team) with no clear endpoint to the learning. It was notable that in both of these cases it was well-known to those organising and running the sites of practice that mere assessment of individual knowledge and skills was but a poor predictor of performance in these high stakes group activity situations.

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