

Chapter Two - The practices of learning through occupations

Stephen Billett

(Griffith University, Australia)

Abstract This chapter draws on historical and conceptual accounts of learning to discuss and illuminate the nature and effectiveness of learning for occupations through practice. This discussion includes an analysis of the historical development of practice settings as places where occupational knowledge is generated, transformed, and sustained over time. It includes some consideration of how these kinds of settings were and are now valued as sites for the learning. Going beyond historical accounts, some of the changing conceptions about processes of learning and how place and culture can shape learning, along with the contributions of the learner, are then discussed. In all, it is proposed that the majority of human development and learning associated with the development of occupational capacities has arisen through practice-based experiences. Before the advent of mass education, practice settings were the inevitable place for the development of the majority of occupational knowledge. Indeed, it is a relatively new phenomenon for this development to occur outside of the settings in which it is practised. Importantly, the kinds of knowledge developed through learning-related activities in practice settings are more than those underpinning easy and repetitive tasks. Instead, they comprise complex, demanding, and often difficult-to-learn knowledge. However, to fully realise the contributions of these settings effective conceptual premises and adaptive curriculum, pedagogical, and epistemological procedures are required.

2.1 Learning for and through Practice

The exercise of skilful occupational capacities is central to quality human existence, and societal progress. The development of these capacities is well aligned to many changes across human history, including the skilfulness required to realise important economic and social provisions. These capacities provide for reliable sustenance and appropriate shelter, the manufacture of material goods and artefacts that provide for safe and comfortable existence and extend to healthcare provisions that secure and sustain good health and long lives. Consequently, the development and remaking of these capacities are of fundamental importance to the development, transformation, and continuity of humans, our societies, and our

communities. So, considerations about how these capacities can be initially developed by novice practitioners and then developed further across their working lives are important priorities for humankind. Yet, it is important within these considerations to view settings in which these occupational practices are enacted as sites for both initial and ongoing development. Indeed, if, in some way, it were possible to quantify the totality of the skilful occupational knowledge developed across human history and categorise these skills by their means of development, there would be one very clear conclusion. That is, the vast majority of those skills have been developed in and through the practice of the occupation, not through activities or institutions that are primarily concerned about skill development (e.g., schools, colleges, universities). Once considered, there is nothing remarkable about such a conclusion, could it be drawn. The existence of specialised educational provisions for developing occupational skills is relatively recent. Prior to the end of the 19th century, only very limited educational provisions for occupations were available and these were largely restricted to those preparing people to become doctors, clerics, and other elite professional through universities. It was only in response to mass social movements in the 19th century that the provision of vocational education emerge in many European countries (Gonon, 2004), for instance. So, when considered, it is noteworthy that the breadth, complexity, intricacy, and extent of the vast majority of the skilful knowledge that humanity has relied upon to get us this far, for good and bad, was and is still being developed through practice. The majority of the historical artefacts to which we look in awe across countries and continents, the ancient buildings and constructions at which we marvel, and the foundations for current occupational practices were all developed in and through practice. Hence, it is necessary to remind ourselves of the importance of learning through practice and practice settings, particularly in an era where provisions of education are taken for granted, and seen as the orthodox and legitimate means through which worthwhile and demanding learning occur. Ironically, it is largely the perceived or demonstrated shortcomings of the learning of occupational practices within educational institutions that is leading to a re-evaluation of the potential of practice settings as places to learn skilful occupational knowledge. Even now, because of the orthodoxies and preconceptions about what constitutes effective and legitimate learning environments for developing occupational knowledge, practice settings likely remain being seen primarily as merely sites to rehearse and refine what has been learnt in education institutions or to augment that learning, and not legitimate and worthwhile learning environments in their own right (Billett, 2009). However, in spite of these preconceptions the settings in which people practice their occupational skills and those practices themselves stand as being the principal sources of the learning and further development of those capacities that are essential for human existence and continuity.

Therefore, in considering issues associated with the qualities of practice settings as learning environments, it is necessary to firstly make a case for their legitimacy, because the orthodoxy is such that what is believed to constitutes an effective learning environment likely remains that offered by an educational

institution, and conceptions of curriculum and pedagogy are also primarily associated with those institutions as sites of learning. Hence, when advancing concepts such as a practice curriculum or practice pedagogies, it is necessary to not only identify those that are particularly suited to practice settings and particular occupational practices, but also to assert them as being worthwhile and valid even though they are enacted outside of educational institutions. It follows that, in this chapter, and in many of the contributions within this volume, precepts associated with learning occupational practice through educational institutions are put to one side. Instead, the focus here is upon concepts, practices, and traditions that arise from practices themselves and how that learning for and through occupations can best be understood and promoted. In focusing on these issues this chapter commences by discussing some historical precedents from Europe and China about learning through practice, and seeks to identify the kinds of curriculum and pedagogic practices that support this learning process. Following this discussion, the chapter identifies the premises that explain learning through practice settings and thereby renders these settings as legitimate and worthwhile sites for developing occupational knowledge. However, this discussion does not proceed without highlighting the limitations as well as the possibilities of learning through practice, particularly when considering the kinds of knowledge required for contemporary occupational practices. So, there is no attempt here to overly inflate and boost the case for learning through practice, because it is well understood that there are both strengths and limitations when learning through processes such as observation, imitation, and rehearsal (Billett, 2001). These limitations likely extend to the learning of knowledge that is symbolic and hard to observe and access. However, there is evidence that effective practice-based strategies have been used to develop these forms of knowledge (Lave, Murtaugh, & de la Roche, 1984; Rogoff & Gauvain, 1984; Scribner, 1984). It follows, therefore, that the chapter progresses with an intent to understand the norms and practices and traditions that explain learning through practice, but also with a consideration of the learning of kinds and forms of knowledge that need to be learnt for contemporary work.

2.2 Historical Conceptions of Learning through Practice and their Worth

There are accounts of learning through practice available from Mesopotamia and elsewhere (Finch & Crunkilton, 1992). But, perhaps one of the earliest, and most impressive, accounts of skill development through practice in terms of the extent and profoundness of that learning and knowledge can be found in ancient China. Here, the development of mass-produced items commenced far earlier than in Europe. The needs here were to sustain a massive population that was well organised, often concentrated in large cities with amenities such as running water

and sewerage disposal, and with organised forms of government, sometimes centrally across an Empire that was geographically expansive. All of these needs required considerable qualities of skilful practitioners. To make a comparison, consider that in 1086, the Domesday book was prepared by the Normans as an audit of what they had secured through conquering Britain. This audit estimated the British population to be between 1.75 million and 2 million people. However, at this time, there were 100 million people living within the Chinese Empire and, for instance, in 1085, the Song government's mint was producing over 6 billion coins a year (Ebrey, 1996). The mint's production process used stone moulds into which molten metal was poured to form the coins. This coin production required high levels of organisation for the production and use of these moulds, the securing of metal ore and fuel to melt the metal, and a distribution system to transport coins across the Empire. Doubtless, also there was quality control and associated mechanisms to protect the currency of the coins. Yet, even long before this era in China there is evidence of the development of significant skilfulness and mass production of artefacts, the capacities for which would be learnt through practice. In the Shang dynasty (1600 BC), large and highly decorative copper vats were manufactured and required a range of skills, and also the bringing together of different sets of skills. In the Zhou dynasty (1050 – 250BC) stone moulds were used to make knives on mass. In the Quin dynasty (221-206 BC) quite intricate bronze trigger mechanisms for crossbows were mass manufactured. These triggers comprised three separate parts that had to be precisely cast in order to function effectively. Moreover, at this time coins, drainage pipes, arrow heads, tiles, et cetera were all mass produced. The Tang dynasty (618-906 AD) became renowned for its production of highly intricate porcelain items, many of which feature complex shapes and many layers of glazes. All these examples indicate that, more than the mass production of artefacts, there is also the development of artefacts requiring high levels of skill and also processes that require understandings and practices dependent upon significant knowledge and the coordination of a range of skills artisans. All of this skilful knowledge was learnt through practice.

Unfortunately, relatively little appears now to be known or can be found about the practices that were used to produce these artefacts or how these skills were developed and passed on to successive generations of artisans. There are some accounts from the production of the Terra Cotta Warriors in the Quin dynasty (221-206 BC) that hint at the organisation and development of skilful practices (Ebrey, 1996). These accounts indicate that there was a very high level of work organisation. The composition of the clay used to produce these warriors was highly consistent. Moreover, each warrior was unique in some way and great differences in these warriors are evident across the entire cohort. Yet, only eight different moulds were probably used to make these warriors, obviously with great skill and adaptability. There are also characters marked on the warriors that identified the workshop where the figure was made as part of a quality-control regime. It seems that in these workshops, these warriors were constructed by a team of artisans working together to mould and form each warrior in a production

line-like process. The process of production was controlled by foremen who were responsible for the quality of individual figures; the foremen were in turn controlled by supervisors. Foremen also marked their name and office or place of provenance on the warriors they produced, thereby making themselves accountable if the sculpture proved faulty in any way (Ebrey, 1996).

From these accounts, it is possible to conclude that in such a highly organised form of production there was considerable learning ordered through practice, which included the organisation of labour and the conduct of tasks, and that these activities were supervised by skilled workers who were directly accountable for the quality of their products. Further evidence is available later about these kinds of processes from witness accounts of the production of porcelain, which indicate that tasks were divided and subdivided and workers became very highly skilled in quite specific tasks and, through practice, came to hone and refine their craft skills. For instance, during the Ming dynasty (1368-1644AD), the Jingdezhen Kilns produced large amounts of high-quality porcelain for the imperial palace. In 1577, orders for 96,500 small pieces and 56,000 large ones and 21,600 items for sacrificial ceremonies were completed. This output indicates not only the ongoing capacity for mass production, but also that the artefacts had to be of very high quality, because the imperial palace only accepted goods of the highest quality. Some time later, in the early 18th century, a French missionary reported watching a cup pass through more than a dozen hands, one worker giving it an initial shaping on the wheel in a matter of seconds, another setting it on a base, another pressing it into a mould to make sure its size was uniform, another polishing it with a chisel, and so on. He reported that as many as 70 people could be involved in the production of a single item. At about this time, the division of labour employed in the decoration of a large set of dishes was described as follows:

If the painted decoration on each piece is not exactly alike, the set will be spoiled. For this reason the man who sketched the line will learn sketching, but not painting; those who painted study only painting, no sketching; by this means the hands acquire skills in their own speciality and their minds not distracted. In order to secure a certain uniformity in their work, the sketches and painters, although kept distinct occupy the same house. (Ebrey 1996, 217)

Here, the processes of the development and enactment of skills through honing and refining of highly specific skills are evident. Likely, these skills were developed through processes of observation, imitation, and practice, as has been reported elsewhere in accounts from anthropology (Pelissier, 1991), and also contemporary accounts of how people learn through work activities (Billett, 2001). However, it is difficult for this assumption to be ratified, as there appear to be few accessible accounts of how artisans learnt their practices in these places. So, although there are drawing of the life and work of such artisans, there are no written accounts available to English speakers.

However, slightly more detailed accounts about learning through practice are available from ancient Greece. Here again, the societal organisation of work had much to do with occupational practice and its learning. Plato discusses these matters extensively, in particular with reference to how opportunities for learning

were to be distributed (Elias, 1995). Following Socrates, he distinguished amongst three classes: rulers, military, and artisans/artists. Importantly, the belief amongst the ruling elite was that people should stay for their entire life in the class into which they were born. Hence, the development of occupational capacities was assigned and constrained by individuals' birthright. Equally, it needs to be remembered that as well as a society premised upon the efforts of slaves, the lowly standing of women also constrained their options. For free-born Greeks, that is, the ruling class, leisure was seen as a key virtue and a worthwhile pursuit, and engaging in most forms of paid occupations was quite inappropriate for individuals in this class. There was a possibility of the ruling class being educated in the professions, if they had to be, and also for the military. However, for artisans and artists, including musicians, their occupational preparation was through apprenticeship, usually within their family. A family would have a specific occupation and those born into that family would be expected to engage in and support that occupation. Consequently, the occupational practices were learnt through association, imitation, and the rule of thumb: that is, experience. Certainly, there were no schools or technical institutes where individuals could learn artisans' skills (Lodge, 1947). As noted, craft and trades work was seen to be hereditary, and passed on from father to son. Indeed, Plato considered this to be the lowest form of preparation, but quite appropriate for those who worked with their hands, and, so he claimed, not with their minds (Elias, 1995, p. 166). It was suggested by Plato, using Aristotle's kinds of knowing, that the only form of knowledge required for such activities was *techne* or technical capacity. Hence, Plato would never have described this kind of learning activity as education. Consequently, the family into which individuals were born did much to shape their choice of occupation. Moreover, it shaped how this occupation was learnt through family activities. Lodge (1947) describes the process of learning an occupational practice in the family as follows:

The son learned his trade by growing up in his father's family, in participating in family activities, imitating what he saw his father doing. At first, the imitation would be playful and childish, carried out with such toy tools as a child could handle. Later, it would become more deliberately purposive. Practice produced technical proficiency in details and a growing boy would act first as his father's 'helper', then as his associate, and would eventually himself become the head of a family, and the centre from which further training in the family craft would radiate. (1947, p. 17)

Lodge (1947) suggests that, in these family-based processes of learning, play was used as a pedagogic device. For instance, with building, the boys would build children's houses, learn to measure, and apply other techniques in play. This provision of support for learning might be extended to adopted sons and also members of other families whose boys were invited to participate. This process was not restricted to artisans' work, as the same process was extended to artists. Yet, like those growing up in families with a particular trade, those in families engaged in music and artistic occupations of different kinds would learn by association, imitation, and practice. However, despite making distinctions between levels of occupations and the kinds of experiences and pedagogies that are

appropriate for them, Plato in *Republic* referred explicitly to the importance of practice in the learning of medicine; one of the occupations that was held to be deserving of an educational provision. He stated that:

The best physicians are those who have treated the greatest number of constitutions, good and bad. From you, they have combined it with that knowledge of the art, the greatest experience of disease. It is better for them not to be robust of health themselves but to have all manner of diseases in their own persons. For it is not with the body, but with the mind that they cure the body. And thus they infer the bodily diseases of others from the knowledge of what has taken place in their own bodies. (p. 42)

Plato appears to be proposing here that because of the kinds of knowledge required for artists' and artisans' work, a more sophisticated provision of preparation was not required. Arguably, this, and his assertion that such workers only required a knowledge Socrates and he described as 'techne' - techniques to make have done much to generate a legacy that lasts until today that many occupations are held to have low skill requirements, and, therefore, can easily be learnt. Also, the idea that ways of knowing now referred to as 'rules of thumb' or heuristics are alone quite sufficient for this kind of work, added to this estimation. Even quite recent discussions about the building of cathedrals in mediaeval Europe proposed that much of the knowledge used was of this kind, rather than guided by scientifically proven principles (Turnbull, 1993). Yet, such claims are contestable. That is, the processes required to produce these artefacts, particularly consistently, referred to above in reference to ancient China, as well as those of ancient Greece and from thereon, were often highly demanding and required high levels of skill and understanding.

Moreover, advancement in understandings about practice most likely arose through experiences in practice, rather than scientific enquiry, which was likely to be the exception. That is, the knowledge for the occupation and higher-order knowledge to organise work, including strategic capacities, arose through and was shaped by these practices. Of course, there are limitations to the knowledge available within a domain of activity, such as building cathedrals, at a particular time (Gimpel, 1961). So, flying buttresses were a practice-based response to maintaining the structural integrity of buildings, which were becoming larger, and this construction had to be premised upon the engineering principles that were known to these practitioners at that time. Yet, this limitation is not restricted to those who worked as artists and artisans. Clearly, the knowledge about medicine, for instance, has grown and developed and, in each era, the work of physicians is shaped by the bounds of that knowledge at that time. Often, the bounds of this knowledge were shaped and extended by processes of practice within the given knowledge available to all kinds of practitioners, and this knowledge was a product of artisans building and reflecting upon their practice. Indeed, much of that knowledge was likely to be learnt through practice and benefited from the opportunity to test, apply, adapt, and evaluate that knowledge. The great European cathedrals were built by generations of stonemasons who passed, from father to son, their knowledge not only of stone masonry techniques (Gimpel, 1961), but also of the principles and practices of making enormous buildings from stone and

wood. These artisans worked on these projects, often across their entire working lives, and had recourse only to relatively simple drawings and diagrams to guide their life's work. Yet, rather than assume that their knowledge was ad hoc and piecemeal per se, it seems likely that they had rich understandings, within their domain knowledge, about their crafts. And, it was these understandings that permitted them to complete these massive projects in the absence of the kinds of knowledge that was highly codified in manuals, intricate drawings, and designs developed by experts, and would be seen as being indispensable by practitioners today.

In addition to learning through practice, individual artisans were required to engage in the ongoing process of remaking occupational knowledge through practice. In this way, societal change and development arose through practice and was not merely a process of reproduction. Instead, learning through practice also brought about significant change in techniques, strategies, and understandings that were then taken up across generations as cultural practices, yet also in ways that contributed to phylogenesis: the knowledge that arises through the species (Scribner, 1985).

Of course, it is tempting to dismiss the processes of learning described above as being something of the past, and not applicable for contemporary times. Indeed, Lave warns us of this possibility (Lave & Wenger, 1991). However, these kind of processes were those being exercised across many different forms of work practice as individuals engaged in either initial learning or continued to develop the occupational knowledge through their engagement with practice. The association between modern accounts and what occurred in earlier practice still suggests that to be effective in supporting learning in practice settings it is worthwhile considering these practices. Yet, clearly some things have changed. The requirement for more deliberate forms of supporting learning was also identified as being practiced in these accounts.

Indeed, anthropological studies provide more detailed accounts of how cultural practices, including occupations, are developed in communities and outside of intentional programs of instruction within educational institutions. There is a rich heritage here of evidence and accounts of the ways in which participation in work processes (i.e., practice) is used to develop the kinds of knowledge and capacity that are required for effective practice. Many of these accounts relate to what was proposed earlier: associations, imitation, and learning arising from undertaking tasks. In particular, observation, listening, and participation feature within this literature, perhaps most famously within Lave's account of the learning of tailoring (Lave, 1990). Moreover, her earlier work on learning through everyday activities (Rogoff & Lave, 1984) provides rich examples of these processes of learning, as does Rogoff's (1990) later book on learning as apprenticeship, which reports on learning associated with a range of cultural practices, including parenting, occurring through these kinds of means. Certainly, my findings on how people learn through their work activities are quite consistent across a range of occupational practices. In particular, workers referred to learning through engagement in tasks, and the contributions of the physical and social setting of the

workplace that were engaged with through processes of observation, listening, and undertaking tasks (Billett, 2001). These accounts emphasise the contributions provided by social settings, but not always through explicit teaching. Instead, processes of observation, listening, and participation feature far more strongly. Indeed, all these processes emphasise an active role on the part of the learner, sometimes albeit apparently passively. So, they emphasise processes of learning rather than being taught. Yet, from the same literature, there are also considerations of being guided or even being taught by more expert partners, which arises in some of these accounts. That is, the practice setting provides a activities and interactions that can be observed, and, as such, serve as clues and queues, models and premises for learning through practice. These artefacts provide bases from which novices may proceed, goals against which to compare their performance, and benchmarks to which they might aspire. They also provide devices to assist the actual everyday practice through which novices might learn.

However, while much of the interaction between novices and experienced practitioners comprises indirect guidance, rather than teaching, there are also instances when direct teaching is practiced. For instance, Micronesian fishermen teach novices during the day in huts and using instructional artefacts about the star patterns by which they need to navigate at night (Pelissier, 1991). This form of instruction uses shells and sticks as instructional devices. It has been concluded that this knowledge is important to know and cannot be best learnt through processes of association and imitation. Therefore, more direct forms of instruction are required to generate these forms of knowledge. The important point here is that not all of learning through practice can proceed on the basis of a pedagogy premised on the activities of learners alone (i.e., observation, listening, indirect modelling). Indeed, increasingly, forms of knowledge required to be learnt for occupational practice are those that are not so easily observable, nor easy to apprehend or understand (Billett, 2006b). Consequently, when considering the importance of the kind of symbolic knowledge that underpins the use of contemporary technologies, the opaque knowledge that sits behind computers and computerised systems, and the kinds of more remote interaction that constitutes so much of contemporary work, it is more likely that pedagogies of practice will need to include those initiated and enacted by a more expert practitioner.

Certainly, most of that learning, albeit through observation, listening, and hands-on activities, will be initiated, directed, and enacted by individuals' interests and capacities. More recent studies of how workers learn their working knowledge through everyday work activities consistently indicate that much, indeed most, of that learning occurs through processes that are analogous to those evidenced in the accounts from ancient China and Greece and reported in the anthropological literature. That is, workers across a range of occupations refer to engaging in everyday work activities (e.g., 'just doing it'), including the opportunities to practise (i.e. engagement in goal-directed activities); the contributions of the physical and social settings secured through observation and listening (i.e., indirect guidance); and the contributions of more expert or experienced coworkers (i.e., direct guidance) (Billett, 2001). These finding suggests that across these

different forms of work, there is a consistent reporting that the knowledge required to engage in new tasks is learnt through everyday work activities in practice settings. This process includes learner engagement and the affordances of the work setting in terms of its provision of activities, artefacts, and interactions with others and these artefacts. All this suggests a need for a curriculum, pedagogy, and personal epistemologies that can assist the development of this knowledge through practice.

One of the intended outcomes of this programme of research is to identify something of the kinds of knowledge that will likely need to be learnt through different kinds of activities and interactions in workplace settings: that is, through practice. A consideration of these kinds of knowledge, and how they might be learnt, is important for explaining the process of learning through practice and the development of practice-based curriculum and pedagogies, because it needs to be understood what kind of experiences are likely to generate what forms of knowledge.

2.3 Participatory Practice: A Conception of Learning through Practice

Given the above, it seems pertinent to now outline conceptions of learning through practice that have emerged from my theorising of them. In particular, the concept of participatory practices is advanced as a means to understand learning through practice. Participatory practices are dualistic. They comprise, on the one hand, how the workplace invites individuals to participate in workplace activities to learn through processes of observation and engagement, and, on the other, the access to the activities and interactions, including guidance, that are central to individuals' learning of knowledge in the practice setting (Billett, 2002). Yet, central to this process is the degree by which individuals' construal of their experience as invitational shapes their engagement in occupational goal-directed activities and how they engage with the guidance from others in the workplace settings. Both these kinds of contributions -- the personal and the situational -- have consequences for individuals' learning. For instance, and as noted, engagement in routine work activities may reinforce and refine existing knowledge, whereas engaging in new tasks may develop new knowledge. Hence, the degree by which workplaces afford these experiences is important for individuals' learning. Yet, it is also salient to understand that what constitutes routine or novel tasks is person-dependent. What for one individual will be a routine experience, for another will be quite novel, hence, quite different kinds of learning will likely be secured through these distinct experiences (i.e., reinforcement for one and new knowledge for another). Certainly, the access to guidance by more experienced coworkers is likely to be important for the development of understanding and procedures that would otherwise not be easily learnt or discovered alone. This guidance can

extend to the sequencing of access to activities and monitoring performance and progression. It can also extend to the use of intentional guided learning strategies that aim to develop procedural capacities (e.g., modelling, coaching) as well as those associated with conceptual development (e.g., use of questioning, diagrams, analogies) (Billett, 2001). It follows that individuals who are only able to access routine activities and/or who are denied support may have more limited learning outcomes than those able to participate in new activities supported directly and enthusiastically by experienced coworkers. However, the capacity to access particular kinds of experiences is subject to workplace affordances. Moreover, rather than being benign, workplaces can be highly contested environments in which to participate and learn (e.g., Darrah, 1996; Hull, 1997).

Indeed, workplace practices may be aimed at limiting or regulating access to prized work, for pragmatic reasons of avoiding the need for everyone to learn (and be paid) to perform prized activities. Also, judgments about individuals' competence or readiness to engage in activities may shape how they are invited to participate in workplaces. Moreover, the participation and guidance afforded individuals is also shaped by work hierarchies, group affiliations, personal relations, workplace cliques, and cultural practices, as well as the kinds of activities in which individuals are able to engage (Billett, 2002). This local constituting of occupational activities is a product of historical and cultural practices (Rogoff, 1990; Scribner, 1997/1990) shaped by the microsocial factors at the situational level. These factors include the local orderings (Engestrom & Middleton, 1996) and localised negotiations (Suchman, 1996) of work settings. These local factors can also shape and privilege the requirements for what constitutes effective performance in the particular setting, as well as relations in the workplace. For instance, it has been shown that employers prefer providing opportunities for younger and well-educated employees at the cost of affordances for older workers (Brunello & Medio, 2001; Giraud, 2002). Then, there are discriminatory practices on the basis of gender and race, and between different kinds of workers (Bernhardt, Morris, Handcock, & Scott, 1998). Consequently, opportunities to participate in and access support and guidance are distributed in ways that reflect workplace norms and practices, which will be discriminatory in particular ways.

Accordingly, individuals and cohorts of individuals may be advanced and experience quite different workplace affordances depending upon their standing, means of employment, status, or degree of inclusion in workplace affiliations or cliques. For instance, in a large manufacturing plant (Billett & Boud, 2001), quite different affordances were identified across the three work areas that were the focus of a study. The diverse bases of these affordances were the product of a complex of situational factors. In one work area -- a consumer advisory centre -- there were very close relations between staff founded in part on their shared concerns and their working on the same shift together, and relationships that were formed in collaborative workplace ventures. While there were some tensions among staff, overall it was a supportive environment for participating and learning the skills required to be an effective team member. However, in one section of the

manufacturing plant, the affordances were construed to be less invitational. This work area was subject to fluctuations in production levels that incited concerns about the continuity of ongoing employment. Workers began to position themselves to secure employment in other sections of the plant. During the study, the manufacturing plant's management announced a cessation of funds for training and overtime. This action merely reinforced these workers' perception that the workplace was not very invitational (i.e. supportive of their learning). It also reinforced cynicism about the company's practices, including enhancing productivity through training. In the packaging area, workers initially reported the work environment as being highly invitational. There were opportunities for advancement premised on the demonstration of individual performance, opportunities to train, and access to information in the workplace. Like the customer service centre, there was a strong sense of working collegially in this area. In each of the three shift teams, there was a concern and even competitiveness for the team to meet its production goals and to solve any production problems before the next shift took over. However, it would be wrong to infer that these workers were 'socialised' through these experiences and were engaging in an uncritical and non-reflective way, and that these settings were benign. Instead, individuals will elect how they participate with more expert partners, as has been shown across a variety of workplaces (Billett, 2001). Moreover, there is another dimension to the contested nature of workplace participatory practices. That is, beyond the contestations that will occur between old timers and new comers, full and part-time workers, those with different occupational and workplace hierarchical affiliations, there will be those between the contributions of the immediate social setting and the personal (Hodges, 1998).

Yet, these affordances and bases for engagement are subject to change, which then leads to different negotiations. Because of the dynamic qualities of work practice, these affordances and indeed work place tasks, goals, interactions, participants, and relations are likely to be changing frequently. In the food-processing workplace described above, the customer service staff took over corporate-wide responsibilities for consumer advice. They also acquired new equipment and software, and an expanded team of workers. In the packaging area, the impact of the curtailment of overtime and funds for training did much to transform the workers' perception of the invitational qualities of the workplace. Like the production workers, they became more cynical about the workplace and its affordances, which became viewed as less invitational. So in different ways, the participatory practices changed across the three work areas.

However, not only the participatory practices, but also the requirements for performance, can change, as with the consumer call centre. For instance, in studies that examined the work and participatory practices of workers over a six-month and twelve month period, each of the workers experienced considerable changes in their work activities and the requirements for work place performance (Billett, Barker, & Hernon-Tinning, 2004; Billett, Smith, & Barker, 2005). These changes included the transformation of a work practice, a shift in the strategic significance of work, and changes to the bases for workplace decision-making. So over the

duration of the 6-month and 12-month periods, key goals for work requirements changed, as did the kinds and forms of the participatory practices. Therefore, and importantly, rather than being a once-off source of knowing, individuals' participation needs to be understood as being constantly negotiated in changing circumstances in order to remain current with the requirements for practice. Hence, the participatory practice that comprises individuals' working lives are likely to involve constant change, including negotiation and re-negotiation with the work practice (Billett & Somerville, 2004). Consequently, the kinds of experiences and support for learning that individuals' experience throughout their working lives will be central to their capacity to participate, learn, and maintain the currency of their vocational knowledge.

2.4 Individuals' Engagement, Agency, and Subjectivity

While the contributions of workplaces are important for learning through work and can be gauged in terms of their invitational qualities, the agency of individuals is also an important basis for engagement with and learning through work (Smith, 2004; Taylor, 1985). In particular, the bases of their engagement, the exercise of their personal agency, and their subjectivity does much to shape their learning. Importantly, individuals' learning is not a process of socialisation or enculturation determined by historical, cultural, and situational factors, because they actively interpret and construct knowledge from what they experience. Therefore, despite the solid contributions arising from participation in workplaces, including those that can be exercised quite forcefully and with great social press, individuals make meaning and personally mediate the deployment and construction of knowledge (Billett, 2003; Valsiner, 2000). Individuals' agency determines how individuals engage in work practice, which then has consequences for individuals' learning. There are many dimensions to this engagement and subsequent learning. One is the interest or effort that an individual directs towards learning something. Effortful engagement is probably required for learning something that is complex and demanding to learn, yet it is directed and sustained by individuals' interests. Superficial engagement in workplace activities likely leads to shallow or less rich outcomes. There are also more foundational issues, such as basic cognition. Not all individuals comprehend and understand in the same way, and nor should they. Hence, the kind of discourses of which individuals have knowledge and to which they have access, and their knowledge of a particular domain of occupational activities, shape how they construe and construct what they experience.

Moreover, the bases for individuals' engagement in social practices are likely to be differentiated and overlapping, and in particular personal ways. Firstly, individuals participate simultaneously in a number of social practices (Lave & Wenger, 1991). However, the quality of their engagement in these practices is unlikely to be uniform. Individuals' interests and priorities temper participation (Glassman, 2001). Full-bodied participation in one social practice (e.g.,

workplace) may be mirrored by reluctance in another (e.g., school tuck shop roster), at a particular point in time. Secondly, individuals' engagement with what is to be learnt is likely influenced by their values and beliefs. This is evidenced by workers of South Vietnamese heritage rejecting team work in an American manufacturing plant, as they believed this kind of work organisation reflected communistic values and practices (Darrah, 1996). Similarly, coal miners and aged-care workers engaged in practices in ways that reflect a gendered identity (Somerville & Bernoth, 2001). This identity permitted them to accept workplace injury and accidents as an inevitable consequence of their participation in their work. So individuals' engagement at work is premised on and can be understood by their personal histories or ontogenies (Scribner, 1985), which result in particular ways of understanding and engaging with the social world (Billett, 1998) and are shaped by their subjectivities --- sense of identity and purpose --- that arise through social experience (e.g. Somerville & Bernoth, 2001). It follows that individuals' subjectivities shape what is invitational, not what is afforded. Hodges (1998) rejected the approach to teaching children that she encountered in a university teacher education course, for example, because these views clashed with her views on how children should be treated. So more than her values being subject to the social practice, her agency and subjectivity served to reject what was being afforded. In sum, individuals use their subjectivities, not some objective view of workplace affordances, to construe what is invitational, and these same subjectivities shape how and what individuals learn through their engagement in workplace activities and interactions.

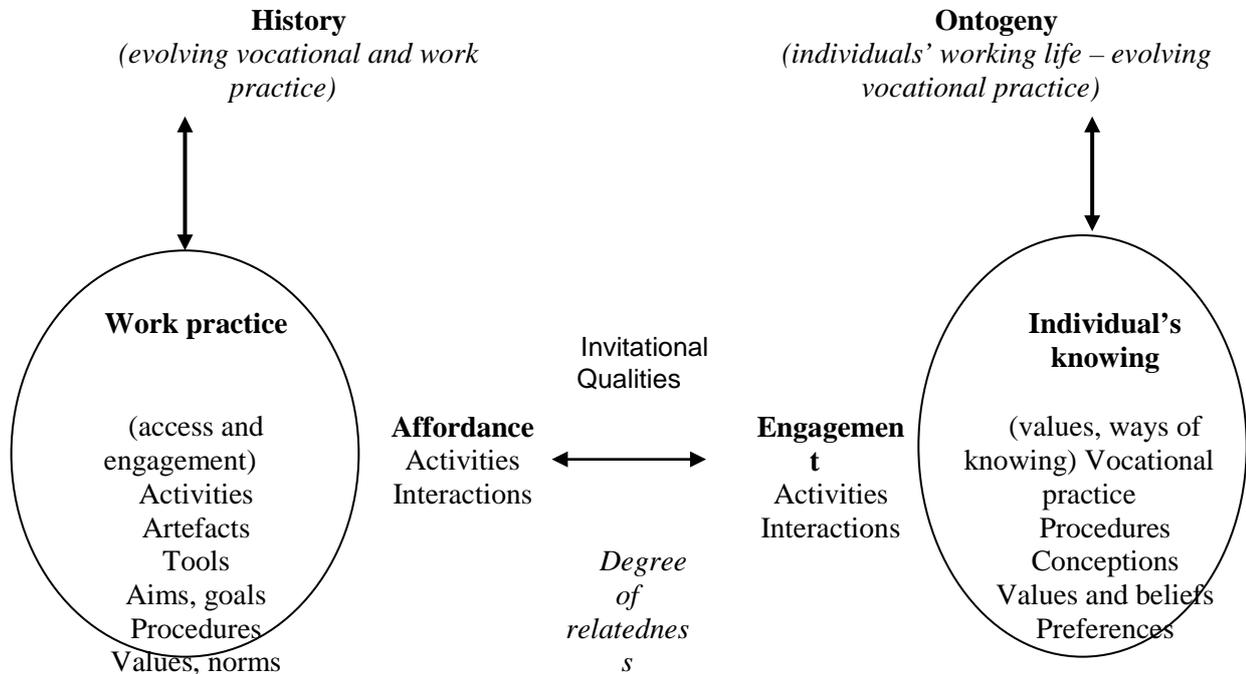
These subjectivities are social in origin. They arise through personal histories from societal facts, such as conceptions of masculinity or femininity, the standing of particular vocational practice, et cetera. But, they are constructed as a personally unique outcome through individuals' personal histories (Billett, 1998), as we engage in different and overlapping ways in social practice throughout our lives. Hence, dualities between the personal and the social experience should not be taken as making distinctions between the individual and the social. Instead, the individual here is seen as being a social product that arises through a socially derived personal history (i.e., ontogeny) that is shaped in personally particular ways across a life history (i.e., ontogenetic development) or, as Harré (1995) suggests, the individual is born a potential person and the personal is generated through interactions with the social world. So, individuals, and their subjectivities and sense of engaging with the world et cetera represents personally and possibly unique sets of social geneses. It is the uniquely social person that encounters, makes sense of, responds to, and enacts their occupational practice in particular circumstances and at that particular moment in time. And, it is the individual's agency that arises through these subjectivities that shapes how they work and learn ontogenetically.

So in regards to the process and outcomes of learning through practice experiences, the duality comprising a negotiated and relational reciprocity between social practice and individuals' agency is a central explanatory concept. Interpsychological processes --- those between/among social partners, artefacts,

symbols, and the physical environment --- are reciprocal, with individuals making judgments about, and potentially transforming their perceptions of, the source of learning. Valsiner (1994) describes this process of knowledge construction as the co-construction of knowledge --- the reciprocal act of knowledge construction through which both the object and the subject are transformed. That is, learning is not the mere acceptance of knowledge from an external source. Instead, individuals are active and discerning in how they deploy their cognitive experience and processes, making judgments about what they encounter and how they respond to what they experience. Analogously, the relations between individuals and social practice are also held to be reciprocal and interdependent between how the work settings afford participation and how individuals elect to engage in and learn from the work practice. Therefore, engagement in work is relationally constituted between the affordance of the setting's practice and how individuals elect to engage with what is afforded them. In describing the relations between the social and cognitive experience, Valsiner (1994) refers to the degree of 'relatedness' between the individuals' values and the norms of the social practice as a consideration of the kinds of interactions, and the learning that will likely arise through these interactions. When considering the qualities of learning that are products of these reciprocal interpsychological processes, Wertsch (1998) proposes distinguishing between the intrapsychological attributes described as 'mastery' --- that is, knowledge constructed without commitment or enthusiasm, and 'appropriation' --- in which the learner constructs knowledge, 'taking it as their own' as Luria (Luria, 1976) proposes. So there can be no situationally determined or uniform outcome to interpsychological processes or intrapsychological attributes. These are negotiated reciprocally between individuals' subjectivities and the social practices in which they participate, as a sociopersonal process.

This dualistic and relational basis for learning underscores the point that what a social practice (regardless of whether it is an educational institution or a workplace) affords an individual can only ever be an intention or invitation. Learners ultimately shape how and what they construct from the situation, based upon their cognitive experience. The degree to which what is afforded is viewed as being invitational is not a given. Individuals construe it through an interaction between their cognitive and social experiences (Valsiner & van der Veer, 2000). Figure 1 depicts these dualistic participatory practices. On the left-hand side is the evolving social practice of the work setting, and on the right hand side the evolving personal history of the individual, that is, their ontogeny. The intersections that constitute the interactions in workplaces are those encountered through participation in work. Changes in occupational practice are brought about by historical factors (e.g., changes in tools and technologies), cultural factors (e.g., needs for particular products and services), and situational factors (e.g., the goals, practices, and participants in the workplace).

Fig. 1 Affordances and engagement in learning through work



The duality, referred to here as participatory practices and as relational interdependence between the personal and social (Billett 2006a) is conceptually significant. It can be seen as illuminating relations between the social world and the mind at intersections between the trajectories of the transforming social practice comprising the work setting and individuals' evolving ontogenetic development, including their subjectivities as they engage in work activities. This duality also infers that to understand relations between social practice and individuals' thinking and acting requires delineating and identifying the invitational qualities of the work setting, from both a social practice and also personal perspectives and, then, how individuals elect to engage in social practice.

These kinds of conceptual and methodological issues stand to make potentially important contributions to current debates about human cognition. Having proposed that there are relations between the mind and society, (Cole, 1998; Wertsch, 1998), it is important to understand further these relationships. Central to these are the origin and sourcing of knowledge that has historical and cultural geneses, yet is required to be taken up by each generation and be purposeful for social and cultural purposes for which it is being enacted (Scribner, 1985; Rogoff, 2003). Another issue that needs to be understood is the degree of social embeddedness of knowledge (Hutchins, 1991; Pea, 1993; Resnick, Pontecorvo,

Säljö, & Burge, 1997). This embeddedness has several components: the degree to which learning is embedded in its source and, therefore, the relationship between individuals' thinking and social practice (e.g. Cobb, 1998) and the consequences of those relations (e.g. Billett, 2006a). Therefore, through understanding: (a) the affordance of social practice, and (b) how individuals' engagement influences knowing and the negotiated and dualistic interdependence between (a) and (b) can make useful contributions to understanding the relations between social practice and individuals' knowing (thinking, acting and learning). Central to these concerns are the kinds of learning or intrapsychological outcomes that arise through participation in social practices and socially derived activities, such as those in workplaces. Illustrating the kind of contributions that might arise, the next section briefly discusses how these relationships inform conceptions of shared understanding (intersubjectivity), and the kinds of learning that occur through participation in occupational practice are briefly discussed.

2.5 Intersubjectivity, Appropriation, and Extending Knowledge

Within sociocultural constructivism, a key goal for learning in social practices is intersubjectivity -- shared understanding between the learner and the more experienced partner. The concern here is that the historically derived, culturally purposeful, and situationally pertinent knowledge needs to be learnt, and in a common way, by those who are to practice that knowledge. Shared understanding is seen as a basis for having a common focus of attention and some shared presuppositions that form the ground for communication and working towards shared goals (Rogoff, 1990). Newman, Griffin, and Cole (1989) propose that because humans construct meaning idiosyncratically, the key purpose of communication is to develop shared understanding. They argue that if humans developed understandings in a uniform way, there would be no need to communicate. However, we do not construct meaning in consistent ways and, therefore, there is need to work towards achieving intersubjectivity or shared understanding because it is quite central to the conduct of everyday human activity and human interaction in processes such as living and working. In terms of learning an occupational practice that is historically and culturally constituted, intersubjectivity is seen as means of achieving shared understanding and as a capacity to perform those practices through interactions with experienced coworkers and accessing an understanding of the requirements of particular instances of that setting. This is a purposeful goal for learning in workplaces and for the development of much of the vocational competence and the expertise required for work performance. Yet, given the discussions above it would clearly be wrong to consider that intersubjectivity will necessarily arise from individuals' construction of knowledge in a socially rich milieu.

Moreover, such an approach to learning and indeed intersubjectivity can be seen as being largely reproductive. That is, it merely reproduces what is already

known. Yet, as noted above, in Wertsch's concepts of mastery and appropriation (1998) and in empirical work (Billett, 2003), even when faced with a strong social pressure to conform, individuals' learning will not be wholly or uncritically intersubjective, because of the centrality of their perspectives or subjectivities. Indeed, it may be necessary to use intentional guided learning strategies to achieve the level of intersubjectivity required for effective work practice (e.g., safe work practices). This is because much of what is required to be learnt (e.g., understanding and procedures) cannot be learnt alone through engagement, trial and error, observation, and imitation. Also, individuals' subjectivities may direct learning in inappropriate ways (e.g., wishing to identify with peers, leading to a rejection of concepts and practices that are important for effective practice). So the concept of appropriation, as defined by Wertsch (1998) and others, should be treated problematically, rather than as an unquestioned good. Appropriation is seen as desirable in so far as individuals making that new learning 'their own' do so because they agree with and understand it. Yet, such a conception of learning outcomes is also problematic. For instance, practitioners might appropriate bad or dangerous practices, because they seem to be efficient by saving time or effort. Hence, intentional close guidance by more expert partners might be required to assist the development of individuals' procedures and concepts required for shared practice.

However, beyond these goals, there is a need to consider the development of novel solutions to problems not yet encountered. So, there is a need to consider approaches to learning and goals for participation in workplaces that extend knowledge and attempt to be generative of occupational practice that is robust enough to transfer elsewhere. In the study of the manufacturing plant, strategies of questioning dialogues and group discussion were used to intentionally extend learning arising from workplace activities and interactions (experiences). The key role that the workplace's affordances play in assisting and supporting the development of these kinds of attributes, as the frequency of the strategy usage was highest in the work area that had the most invitational qualities, as an objective and observable measure (e.g., support, sharing, common concerns, opportunities to engage and discuss). In all, this hints at the need to consider critically the dual, negotiated, and relational nature of intrapsychological processes and the kinds of intrapsychological outcomes (i.e., learning and the remaking of work practices) that arise through these processes.

2.6 Participation and Learning

In conclusion, a consideration of participatory practices can assist explain the processes of learning through practice and inform how they might be improved. Central here it is the need to elaborate further the nature and consequences of relations between the personal and the practice setting. It has been proposed that these relations are structured by the participatory practices that comprise, on the

one hand, the affordances of the practice setting, and on the other hand how individuals elect to engage with what is afforded them. It is through these dualistic, but negotiated processes that individuals construe and make judgments about the invitational qualities of what they experience, and hence how they participate in and learn from these experiences. The outcomes of learning, as much as the processes themselves, are socially shaped. This is not a negotiation between the individual and social, but between individuals, who have construed and constructed knowledge in personal ways throughout their life history, participating in a further negotiation of that knowledge while they engage in work. This learning can be seen as being directed towards promoting intersubjectivity within the knowledge required for workplace tasks and interactions. However, central to all these debates is the significance of the relationship between the social practice and the socially derived person. Whether referring to the construal of affordances (the setting's invitational qualities), the kinds of interactions that occur, and the learning processes and outcomes that arise, the dualistic, interdependent, yet negotiated relations between individuals as workers and the social practice that comprises that work setting remain a predominate consideration. Understanding these relations in terms of reciprocal participatory practices is central to understanding learning through work, yet also extends to learning more generally. Here, a way of illuminating those relations has been advanced here as participatory practices in explaining the process of learning through practice.

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