Co-participation at work: Knowing and working lives

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This paper conceptualises bases for learning or coming to know in workplaces. These bases comprise interdependencies between the way access to workplace activities and guidance is afforded, on the one hand, and how workers elect to engage with what is afforded to them on the other. These reciprocal bases for thinking, acting and learning (knowing) are referred to as co-participation at work (Billett 2001a). The key contributions that workplaces make to workers' learning comprise learners' access to workplace activities and guidance. However, access to these contributions is not equally available. How they are distributed and accessed is shaped by the degree by which the workplace invites individuals to participate in and learn from these experiences. In particular, how access to prized knowledge is distributed and to whom reflects workplace norms and practices. Yet, beyond what the workplace affords, how individuals construe the invitational qualities of what is afforded and elect to engage with work activities also shapes what they learn. Recent accounts emphasising relations between mind and social practice, such as those of Valsiner (1994) Valsiner and Van de Veer (2000), Wertsch (1991, 1998), Cole (1998) and (Lave 1991), rightfully propose interdependencies or degree of relatedness between individuals' thinking, acting and learning, and social practices and sources. These and other accounts (e.g. Cobb 1998; Scribner 1997b; Valsiner 1992) also acknowledge the complexity of the interdependencies between individuals' acting and social practice, and the influence upon cognition. A salient premise here is that engagement in work and what is co-constructed through work is negotiated reciprocally between the evolving social practice of the workplace and individuals' ongoing development founded in their ontogeneses. Work practice, as instances of social practices, are constituted by yet constantly being transformed through historical, cultural and situational lines of development (e.g. Scribner 1985; Cole 1998). Moreover, as workplaces are contested environments, participation and knowing are subject to the norms and practices that shape the affordances extended to workers or cohorts of individual workers and, in turn, what they construe as the workplace's invitational qualities. Understanding participation in and learning at work illuminates relations between social and cognitive contributions to adult development throughout working lives.

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Work, participation and learning

For those interested in the development of adults' vocational practice, an essential concern is to understand how individuals come to learn and maintain that practice through work and throughout their working lives. Recent and increasing demands for workers to take responsibility for the currency of their vocational practice, transformations in vocational practice and the decline of interest by employers in supporting the maintenance and development of employees' practice (Carnoy 1999) all add to the urgent need to understand the bases for learning throughout working life. Moreover, it seems that regardless of whether individuals are learning through everyday work activities or through intentional guided learning in the workplace, their participation in activities and guidance is often subject to contested workplace practices (Billett 2001b). Therefore, given the strong associations between participation in social practice and learning (e.g. Lave 1993; Rogoff 1995), understanding how learning proceeds through experiences at work may assist the task of maintaining and developing further individuals' vocational capacities across their working lives. Discussions about adult development of this kind both draw upon and inform deliberations within sociocultural constructivist perspectives and historical activity theory. Within Vygotskian-derived sociocultural theory, these deliberations necessarily focus on: (i) the relations between engagement in the social practice of work and adults' development; (ii) the relations between individuals' ontogenies (evolving life histories)

and history (e.g. transformations in the workplace); and (iii) conceptions of inter-psychological processes — those between individuals and social sources — and intra-psychological outcomes — cognitive changes within individuals arising from inter-psychological experiences. These deliberations are unified by the imperative to understand further the relations between individuals and social practice, manifesting itself here in discussions about what comprises knowing (learning, thinking and acting) through work.

To conceptualise bases for the thinking, acting and learning that constitute knowing throughout working life, this paper elaborates the concept of co-participation at work (Billett 2001a): the reciprocal process of how the workplace affords participation and how individuals elect to engage with and participate in work activities and interactions, and learn co-constructively through them. It emphasises the negotiated and relational interdependence between contributions to knowing afforded by the workplace and also how individuals decide to act in those practices. If the bases for the co-construction of knowledge in workplaces are to be understood, it is necessary to outline some premises of the relations between individuals' social and cognitive experiences (Valsiner & van de Veer 2000). Therefore, before elaborating the concept of co-participation at work, it is useful to position this concept within some key debates focussed on the relationships between the social and cognitive experience. It is proposed that considering relations between ontogeny and history offers a basis to understand the development of individuals throughout their working lives. Also, rather than viewing intra-psychological outcomes as being a fixed product of inter-psychological processes, a more iterative and relational interdependence is proposed. In all, individuals are positioned as being uniquely, yet socially-derived, entities engaging in social practices that are historically, culturally and socially shaped. It is the intersection between the transforming social practice and individuals' evolving ontogenetic development that is most constitutive of the cognitive development likely to occur through their participation in work.

Throughout, the term 'knowing' is used to link learning with thinking and acting as something projected out beyond the body, rather than being wholly an internal process of the mind. The use of the term 'knowing' aims to shift the focus from categories of knowledge (i.e. declarative, procedural) which are often proposed as distinct from each other (i.e. in cognitive psychological accounts) rather than interdependent. These categories of knowledge are often portrayed as being entities that act *upon*, rather than those whose purpose and developments are premised on acting and developing *within* the social world. The concept of 'knowing' also draws together the processes separately described as problem-solving, learning and transfer in the cognitive literature, and represents knowledge as processes rather than structures characterised by fixedness (e.g. cognitive structures).

Relations between social practice and individuals' thinking and acting

The need to identify and understand the relations between the mind and the external world has arisen from the general abandonment of a dualism between the mind and the social world. However, having

proposed that the mind is embedded in the social world (e.g. Scribner 1997b; Wertsch 1991), the nature of this embeddedness, and how learning is influenced by the complex of social factors that individuals encounter through their ongoing interactions with the social world throughout their life history are just some of the relations needing to be understood more fully. Therefore, some consideration of socially derived activities and their cognitive legacy presents a useful starting point.

Within cognitive and sociocultural constructivist theories of learning, there is some consensus that engagement in conscious goal-directed activities and the process of learning —a process that leads to some kind of semi-permanent or permanent change in individuals - are synonymous. Both the sociocultural (e.g. Rogoff 1990, 1995) and cognitive constructivist perspectives (e.g. Anderson 1993; Shuell 1990) propose that the kinds of socially derived goal-directed actions in which individuals engage will shape, refine and/or reinforce the knowledge they construct. It follows that relations between the mind and the social world necessarily become the focus for understanding how workers' development proceeds across the span of a working life. This is because individuals' ontogenies will be shaped by and will, in turn, shape the work practices in which they participate. Some bases for understanding these relations have already been advanced. These include reconciling cognitive and sociocultural theories of knowing and learning (e.g. Rogoff 1990, 1995) that separately and respectively accentuate conceptions of the mind as interacting with and appropriating historical, cultural and situational sources of knowledge. Commonalties and mutual contributions have been identified in this work (e.g. engaging in goal-directed activities), despite the distinct orientations (and some would argue irreconcilability) of these theories (Billett 1996). This reconceptualisation proposes social practice as an active and interdependently constituted component of thinking and acting (Rogoff & Lave 1984), rather than as a mere context in which thinking and acting take place. It also seeks to understand the interweaving of and interdependence between two lines of development: the individual and social (Valsiner & van de Veer 2000) through engagement in socially-derived activities. Other work has considered these relations in terms of the distribution of cognitive contributions across social systems (cognition is shared with others and artefacts) (e.g. Hutchins 1991; Resnick et al. 1997; Suchman 1997). These views refer to knowing being distributed across the social practice (e.g. the workplace) through interactions, tools, artefacts, norms, goals and practices. These cognitive contributions include the individual acting (e.g. in the workplace), thereby making an individual's cognition and development dependent on the social system in which they act. Some (e.g. Pea 1993) adopt a radical position on distributed cognition, proposing that the individual comprises but one element in that distributed system of knowing. However, such views do not satisfactorily explain the differences in the apparently relative independence of individuals' acting (e.g. Hodges 1998) on the one hand, and situational dependence on the other (e.g. Lave & Wenger 1991). The interdependence constitutes this development is not satisfactorily explained by positions that emphasises either wholehearted embeddedness or independence. Instead, different degrees of reciprocity and

interdependency between social and cognitive contributions to cognition through activities are more useful ways of understanding these relations.

Activity theory (Leonteyev 1981) also views cognitive and motivational processes as being embedded within the ‘larger activity structures whose goals they serve’ (Martin & Scribner 1991, p. 582). Activities such as those undertaken in the workplace are held to be reciprocally transformational, mediating through interactions between individuals and social circumstances (Cole 1998; Scribner & Beach 1993; Wertsch 1991, 1998). Taking activities as a key premise, Scribner and Beach (1993) make three claims about these relations. First, rather than favouring one or the other, activity involves the mutual contribution of memory in the head and memory (stimuli) in the environment. Second, activities are goal-directed, with goals being shaped by particular settings and circumstances. Through engagement in these activities, individuals’ cognitive processes are engaged and transformed in some way. Third, memory is viewed as being both social and cognitive, just as salt ‘can no more meaningfully be separated into sodium and chloride, while retaining its saltiness’ (1993, p. 188). Although not illuminating the character of those relations, these authors’ claims emphasise the interdependence of both the social and the cognitive contributions to individuals’ knowing. Other perspectives emphasise interpersonal and semiotic mediation between social sources and the mind (e.g. signs and tools) (Hutchins 1991; Scribner 1985; Wertsch 1985) as means for understanding thinking, acting and learning. Scribner (1997a) underscores the significance of this kind of mediation when declaring that, whereas human cognition and development have traditionally been discussed in terms of relations between the organism and the environment, cultural mediators operate as an intermediary between them. In views ascribed to Vygotsky (1978), a distinctive quality of humans is that interactions are conducted through the intermediacy of cultural tools and signs — through language, for instance. When we use language, work or otherwise engage in purposive goal-directed activities that have historical and cultural geneses and are patterned by social practices, our cognitive functions are engaged by and developed further through these actions inter-psychologically. These ideas seem pertinent to a consideration of the development of individuals’ vocational practice through their participation in work. Not only does vocational practice have cultural and historical geneses; the way interactions and communications occur, and how the tools and artefacts of vocational practice are developed and deployed, are also socially and culturally constituted. Therefore, participation at work reciprocally engages individuals with these sources and represents a basis for understanding vocational skill development.

Although interdependence between the social and cognitive experiences (Valsiner & Van de Veer 2000) is common to these accounts, the particular privileging of these relations is accentuated in different ways and have different emphases. It is commonly held, however, that activities and artefacts, along with other mediational means, are products of socio-historical development and that individual development is, in part, explainable through engagement in and transformation of goal-directed activities and access to these mediational means. Indeed, history — in conjunction with

ontogenetic development (Scribner 1985), such as that occurring through adults' working lives — helps conceptualise how human development proceeds.

Perhaps most contentious, in current theoretical conceptions and analyses, is the positioning of the individual in these relations. The degree to which individuals are embedded in social practice or act independently is the subject of diverse claims. Here, the relations between the social and cognitive experience is proposed as not being a case of the individual versus the social, but instead how the experiences that constitute individuals' ontogenies are themselves intertwined interdependently and relatively with social practices in which individuals engage. This relationship is discussed in the following conceptual premises in order to elaborate upon the inter-psychological processes that are shaped through the reciprocal processes of engaging in workplace tasks.

Ontogeny and history

Ontogenetically, individual development across a working life can be conceived as the history of individuals' thinking and acting through a continual stream of conscious thought (Meade 1934), with those processes being shaped, mediated and transformed through their participation in socio-historically derived activities (Scribner 1985), such as paid work. Vygotsky (following Bolonsky) proposes that 'behaviour can be understood only as the history of behaviour' (Vygotsky 1978, p. 8). Linking ontogeny with history suggests purposeful relations among sociohistorical and sociocultural transformations, cultural mediation and individual development. The vocational practice that comprises paid work and the way it is organised and enacted, as well as the requirements for performance, have historical and social geneses and, moreover, are in constant transformation. This transformation is variously shaped by changes in cultural need for the vocational practice and its technological requirements, and by the individuals and artefacts comprising a social practice of work in a particular workplace setting. Moreover, as goal-directed activities and work practices change, so do the bases for and means by which individuals come to know (or learn). Over time, changes in sociocultural needs, as manifested in vocational practice, will lead to transformations (e.g. in the printing industry, with hot metal typesetting being replaced by electronic processes), as well as the decline of some vocational practices (e.g. watch repair) and the emergence of others (e.g. website development). These transformations are historically and culturally determined, as paid vocational practices are manifestations of sociocultural need (Scribner 1985, Billett 2001b). That is, without a culturally derived need for these vocations they would cease to be practised. Accordingly, development across the span of a working life inevitably positions closely ontogenetic development with history, as ontogenesis is the product of individuals' unique pathway through a lifetime of engaging in social practices. Therefore, for human development across a life span, history seems a more useful explanatory principle than phylogenetic development (i.e. evolutionary changes in the species). Development across working lives can therefore be seen to be sourced in historical practice and adults' development founded in their engagement in historically derived activities and the

transforming of the mediational means in which they engage as they participate in work activities. In these ways, work engages individuals with history, and the ontogenetic development that arises from these activities is related to history.

Reciprocity between inter-psychological processes and intra-psychological outcomes

Conceptions of inter-psychological processes and intra-psychological outcomes, as attributed to Vygotsky (1978), offer useful bases for understanding how knowing and doing coalesce at work, and the mutuality of relations between the social and the individual. Inter-psychological processes, when defined widely, have been emphasised in accounts of distal or indirect contributions to cognition (e.g. Scribner 1985). These processes include observations of practices and the layout of physical environments (e.g. the relations implied by the spatial arrangements in churches and schools). Including socially and culturally derived artifacts accentuates the cultural and situational levels of sociogeneses and their contributions to cognitive experience through inter-psychological interactions. Given Vygotsky's concern about signs and tools, the conception of the inter-psychological is clearly extendable to these more distal forms of interactions, including those with non-human objects and artifacts. Psychological accounts of intra-psychological outcomes have traditionally referred to internal mentalistic processes and structures within the individual (Scribner 1997a). However, for Vygotsky (1978), the 'internal' is something that continues to interact with and be transformed in an interdependent process by cultural as well as individual developments. This is an important distinction. If sociogenesis is only a means of representing stimuli encountered in the social world, then it would be merely uni-directional (and behavioural). Instead, inter-psychological processes continue to shape intra-psychological outcomes as the 'result of a long series of developmental events' (Vygotsky 1978, p. 57) and the 'process being transformed continues to exist and to change as an external form of activity before definitively turning inward' (1978, p. 57). This view proposes that knowing arises through ongoing engagement in the interdependent and iterative interactions with social sources and mediation over time, before ultimately becoming an intrapsychological process or representation. The point at which this iterative and reciprocal process ceases and (or even if) some more fixed representation results remains unclear (Hutchins 1991). Rather than resulting in some fixed attributes it seems intra-psychological processes continue to be shaped by interactions between social processes and cognitive outcomes.

In emphasising inner functions arising from 'only extended periods of development', associations with changes in activities mediating development are identified. Hence, rather than 'internal' processes being remote from history, the ontogenetic development arising from working life and history can be seen as progressing in parallel yet negotiated ways. This suggests that the common view of Vygotsky's (1978) sequencing of cultural development occurring first on the social, and then the individual, plane needs elaborating to account for the ongoing interactions between these two

planes of development. Further, not only are these interactions ongoing, they are shaping yet being shaped — rather than intra-psychological attributes being wholly turned inward and fixed.

Positioning the individual in sociogenesis

Positioning the individual (the cognitive experience) within sociogeneses (the social bases of human development) remains a contentious area of psychological theorising (Scribner 1997b; Smolka, Goes & Pino 1995). In some accounts, the individual has been positioned as a mere and dependent element in the distributed nature of cognition, (Pea 1993; Hutchins 1991). Such accounts, by different degrees, deny individuals acting interdependently within social systems, such as workplaces. Other views (e.g. Valsiner 1994; Lawrence & Valsiner 1993) propose reciprocal bases for thinking and acting. Cobb (1998) cautions against assuming that all thinking and acting is wholly distributed across social systems. Similarly, Salomon (1994) and Engestrom and Middleton (1996) propose that not all cognitive activity is situated or distributed; instead, individuals are able to act independently in the social world. While supporting the necessity to review the overly individualistic and mentalistic emphasis in mainstream cognitive accounts, Cobb (1998) proposes a greater consideration of individuals' agency in relations between the mind and the social world.

Inter-psychological processes are shaped by social practice, they are not immune to contributions that participation in other social practices have made to individuals' ontogenies. Hodges (1998) has described how participation in a particular social practice (i.e. a teacher education course) led her to question the basis of that practice — something that ultimately resulted in her dis-identification from that practice. There were unacceptable inconsistencies between her ontogenically-derived values and goals and those of the social practice of teaching young children into which she was being initiated. Consequently, she withdrew but not before developing a critique of that practice. Different patterns of participation and outcomes can be seen as arising from engagement in other kinds of work practices. For instance, in Australia some coal miners live in remote coal mining communities where affiliations extend beyond the workplace and influence activities in those communities. Hence, for these coal miners, participation in social and recreational activities in the communities is influenced by and reinforces cultural norms associated with the coal mining communities (Billett 1995). However, other mine site workers are contract workers without union affiliation, and are employed on a 'fly-in and fly-out' basis. These contract workers' practice is influenced by different kinds of subjectivities and identities from those who live in the coal mining communities. Not only is their engagement and participation within the workplace premised differently, but the kinds of social practices they engage in and identify with, and their relationship to participation at work, are also likely to be distinct.

These ideas build upon precepts of learning being negotiated by individuals through co-constructive processes of knowledge construction (Valsiner 1994; Lawrence & Valsiner 1993). Individuals do not construe the invitational qualities or engage in a unitary way within social practices

such as workplaces. Valsiner's (1994) refers to degrees of relatedness between individuals' goals and values and those of the social practices in which they engage (see Figure 2). This relatedness ranges from maximum social relatedness to total independence of individuals acting in the social practice. The bases for these negotiated interactions are premised on the degree to which there is concurrence between the individuals' ways of knowing (including their values and beliefs), founded in their ontogeny, and the cultural norms and values of the workplace. Goodnow (1990) suggests not only that individuals learn through problem-solving, but they also decide which problems are worth solving. Thus, there is an independence of individuals' agency within the interdependence of the social practice of work (Engestrom & Middleton 1996). Indeed, Valsiner (1998) suggests that individuals need to and actively ignore most of social suggestion to maintain their equilibrium. Given the idiosyncratic nature of individuals' experiences throughout their life history, individuals' the ontogenetic development will likely result in unique dispositions, ways of knowing and knowledge (Billett 1997; Newman et al. 1989). This development arises from interdependent engagement in social practice of different kinds throughout their ontogenies. It is unlikely that uniformity in either engagement in social practice or outcomes from that engagement will arise through individuals' participation in workplaces. Individuals' vocational practice and ways of knowing will likely develop as a product of participation in different and often overlapping work practice across the life span. In this way, individuals' knowing (i.e. their learning, problem-solving and adapting) or cognitive experience is a product of their unique socially derived histories acting in transforming social practices. In proposing such a case, the aim is to locate a path between the 'twin hazards' of individual constructivism (particularly when portrayed as being overly mentalistic) and social determinism (Miller & Goodnow 1995).

Co-participation at work: learning through working life

As foreshadowed, co-participation at work refers to the interdependent process of engagement in and learning through work. In considering learning throughout working life it is important to understand what shapes the co-construction of knowledge in workplace settings. Here, it is advanced that workplace participative practices (Billett 2002a) are most salient. On the one hand, they elaborate how individuals are permitted to participate in workplaces, as determined by the affordance or invitational qualities of the workplace. On the other hand, they illuminate ways in which individuals elect to engage with and participate in the workplace and, through their participation, co-construct and refine their knowing. Both kinds of participatory practice influence how (and which) individuals engage in vocational activities and how they come to know. The affordances (Gibson 1969) or invitational qualities of the work places practices are proposed as shaping individuals' participation at work and mediating their knowing. That is, the kinds of activities and guidance individuals are able to access and elect to engage in will shape their learning. However, this participation, and therefore learning, is also mediated by the degree that the individual construes what is being afforded as invitational. This shapes how they engage in the workplace activities and interactions from which they come to know or

learn. Co-participation is constituted at the intersection of the trajectories of the evolving social practice of the particular workplace on the one hand, and individuals' socially shaped personal histories or ontogenies on the other (see Figure 1). However, not depicted in Figure 1 is the simultaneous participation in other social practice (e.g. family and community life) (Lave & Wenger 1991; Billett 1998b) that influences how they are able or elect to participate at work. These might include practices likely to directly influence engagement in the workplace, such as membership of a trade union or professional groups, or involvement in recreational activities with coworkers. Other forms of participation, such as family commitments and participation in local community groups or other work commitments also influence individuals' participation at work. For instance, Hull (1997) notes that some contingent workers (i.e. part-time, contractual) are required to engage in multiple forms of employment, something which influences their participation in each and may, in turn, inhibit their ability to participate fully in a preferred work situation.

Figure 1: Intersection between evolving social practice and evolving ontogeny

Workplace participatory practices are constantly transforming (Billett et al in press). Being shaped historically and culturally in terms of the activities to be conducted that reflect evolving cultural need, vocational practices evolves over time. Situational factors, such as workplace norms and practices constitute the requirements for vocational practice in particular and dynamic ways (Engestrom & Middleton 1996, the 2001c). These factors also shape the distribution of opportunities to participate in goal-directed activities and access guidance in the conduct of work activities. Workplaces permit participation and learning in so far as they secure workplace needs and/or particular interests within them (Billett 2001b). That is, participation is permitted when it supports the workplace's continuity including particular interests within it. Individuals will be permitted to learn tasks that support the goods or services the workplace provides. They may be inhibited if that learning

changes the balance in the control of production of those goods and services (Danford 1998), or encroaches on the work and standing of others (Bernhardt 1999). In particular, individuals may be inhibited from learning what the workplace prizes or that knowledge that other individuals or their affiliates hold as their own. The knowledge to be learnt has historical, cultural and situational geneses. Therefore, how workplaces mediate the access to these activities and also the kinds of guidance from more experienced workers influences individuals' access to this work-related knowledge. That is, workplaces practices mediate and distribute the opportunities to engage in the kinds of inter-psychological process required to access and construct the knowledge required for workplace performance. So consideration of workplace participatory practices can assist understanding how learning proceeds through work. Further to this, the kinds of activities in which individuals are permitted to engage (e.g. the degree of their routineness) have consequences for the quality of learning (e.g. whether it is refinement or the construction of new knowledge). Similarly, access to intentional learning opportunities, such as close guidance by more expert coworkers, also shapes the prospect that engagement in work activities will be generative of the kinds of learning unlikely to be secured through discovery alone (Ericsson & Lehmann 1996). Accessing the kinds of knowledge that will not be easily learnt alone — for example, heuristics (tricks of the trade) or conceptual knowledge that is opaque — are dependent upon interactions with more experienced coworkers who are able to provide access to this socially derived knowledge.

Nevertheless, there is a relative reciprocity in both engagement in and learning through work. Ultimately, individuals exercise agency that determines how they engage with the activities and guidance afforded by the workplace (i.e. whether it is full-bodied or superficial engagement). Wertsch (1998) following Leontiev (1981) distinguishes between two distinct forms of intra-psychological outcomes arising from the exercise of this agency. Commitment to what is learnt arises from a relatedness of values between the individual and the social practice is termed *appropriation*, where the learner concurs with what it to be learnt. Learning arising from social press that is not consistent with the learners' beliefs is termed *mastery*, and may only be learnt and used in ways required to fulfill the requirements of social press (e.g. the unconvincing salutations offered by supermarket checkout operators). Individuals' decisions about whether they appropriate or master likely to be a product of their socially derived ontogenies, developed and transformed through the unique combinations of participation in different kinds of social practice constituting individuals' life histories (Billett 2003). Therefore, individuals' construction of the workplace situation, the degree by which it constitutes an invitational environment and how they elect to participate in the workplace will be a product of how unique, but socially-derived inter-psychological processes are shaped by previous experiences. How individuals engage with activities and guidance, and thus come to know, is therefore a product of interdependent between the affordance of the workplace and the ways in which individuals' elect to participate in the workplace. These reciprocal bases are now discussed in turn.

Workplace affordances

Understanding workplace affordances requires a consideration of the social practice of work as being situationally constituted, which shapes the work activities, norms, guidance and enacts participatory practices. The knowledge to be constructed, the kinds of problems to be resolved, the problem solutions, and the kinds of support and guidance available are the product of particular social practices (e.g. Lave & Wenger 1991; Wenger 1998), with their norms, practices and goals. So although knowledge has a socio-historical genesis, it is manifested in particular ways by cultural need (Scribner 1985), with situational factors shaping the situational basis for performance (Billett 2001c; Scribner & Beach 1993; Engestrom 1993). These factors are likely the product of local ordering (Suchman 1996) and negotiations (Engestrom & Middleton 1996). Together, they shape the affordances advanced to particular individuals or cohorts of individuals, including the activities individuals can participate in and the guidance they receive. These affordances are central to inter-psychological processes of ‘coming to know’. As noted, the kinds of work activities individuals are invited or able to engage in (i.e. whether they are routine or non-routine) will likely have consequences for what they come to know through their participation in work. Individuals’ participation is rendered variable by workplace norms and practices. Each workplace likely privileges particular goals and procedures that are a product of its unique activity system and has particular pathways of activities that sequence tasks from those of lower to higher accountability (Lave 1990, Billett 2002a). It follows that how workers participate and come to know is shaped by how they are invited to participate in the workplace activities and the guidance they can access. These constitute its invitational qualities — in particular, by gaining access to knowledge that will not be learnt alone or through imitative acts requiring intentional close guidance. The availability of access to direct guidance in the workplace (required to access knowledge that would otherwise not easily be learnt) also influences what individuals will come to know during their working lives. The willingness of co-workers to provide guidance, to whom and under what circumstances, shapes the quality of access to that knowledge. Workers who fear displacement are unlikely to support the learning of those they fear will displace them (Lave & Wenger 1991).

Workplaces are contested environments and opportunities to access activities and guidance are distributed unevenly across workers. Workplace affordances are constituted and distributed by workplace hierarchies, group affiliations, personal relations, workplace cliques and cultural practices, and the kinds of activities in which individuals are able to or are requested to engage (Billett 2001a, 2001b). Opportunities to participate in activities, access support and guidance are not always available or uniformly distributed across participants. Beyond judgments of individuals’ competence, bases for affordances include race (Hull 1997), gender (Bierma 2001, Tam 1997), worker or employment status (Darrah 1996) and affiliations (Billett 1999). Darrah (1996) notes support for learning being directed to those workers who were most valued in the workplace, whereas other coworkers whose tasks were equally demanding were denied support. Coal workers whose affiliations were unacceptable to co-workers with other affiliations were denied access to practise on the plant and equipment required to

become competent in new work tasks (Billett 1995). Contingent workers (i.e. those who are part-time and contractual) may struggle to be kept informed and participate fully (Tam 1997), and to be granted opportunities to expand their role and be supported by guidance from full-time employees (Bernhardt 1999). For example, women, often find workplaces uninviting and resistant of their development (Bierema 2001). In these ways, the invitational qualities of the workplace are far from benign or evenly distributed. They are socially determined and are the product of power relations (Fenwick 2001, Solomon 1999).

Moreover, situational factors, such as workplace affordances are in constant transformation — they are never fixed (Lave & Wenger 1991, Billett et al in press). Those not able to secure ongoing access to the changes in workplace goals and procedures could be marginalised and the potential for learning arising from inter-psychological processes degraded. In sum, while workplaces can afford access to activities and guidance required for maintaining and developing adults' vocational practice through work, the bases for participation are contested and not equally distributed to all who want to participate in them. So a complex of social factors shapes workplaces, their participatory practices and potential for coming to know through participation.

Individuals' participation as engagement at work

Despite the significance of the contributions of workplaces, individuals' knowing is not a process of socialisation or enculturation arising from participation in work. Instead, their agency also determines how they participate and engage in activities and responded to guidance they are being afforded in their workplace. There are distinct bases for conceptualising individuals' participation in work. As noted, at any time individuals participate simultaneously in a range of social practices. They are unlikely to split their time, effort and attention uniformly among these practices (Billett 1998b). Instead, individuals' interests and priorities direct participation. Full-bodied participation in one social practice may be mirrored by reluctance in another. This is referred to by Valsiner (1994) as *relatedness* between the norms and values of the social practice and individuals' values and preferences (see Figure 2). Depicted in Figure 2 are the parallel trajectories of evolving history as it pertains to the particular work practice and evolving ontogeny of the individual. Each have their goals and intentionalities, that direct their trajectories. The workplace affords activities and interactions and, depending upon the individuals construal of those affordances, and factors associated with their own progression, will determine how they will engage. The degree of engagement is likely premised on the relatedness between the workplace and ontogenetic goals

Fig. 2 Co-participation at work

In this way, the bases for negotiated interactions between individuals and to workplaces need to account for the degree of relatedness between the individuals' ways of knowing (including their values and beliefs), founded in their ontogeny, and in the workplace's cultural norms and values. For instance, individuals might engage effortfully in their paid vocational activities while participating less effortfully (or even resentfully) in the rostered school tuckshop activities, working bee or annual fete, or vice versa for others. Some aspects or applications of work tasks will be treated less favourably or preferentially by some workers than others. Underground coal miners have expressed reluctance to engage in open-cut coal mining, which they see as a lowly form of work; and hairdressers from trendy inner-city salons may be quite uninterested in working in a suburban salon. Workers of Vietnamese heritage in an American computer manufacturing company resisted the implementation of teamwork when they conceptualised it as reflecting the 'communist' values of collective rather than individual action — the very thing they had fled from Vietnam to avoid (Darrah 1997). Coal miners who viewed safety training programs as the mine site management's attempt to transfer the responsibility for safety on to the miners participated in the training program with reluctance and suspicion (Billett 1995). Analogously, what Hodges (1998) came to know through the participation in practice teaching was quite different from what was intended, resulting in her dis-identification with the orthodox teaching practice of childcare, because it conflicted with her personal values. In these ways, individuals' participation in social practice is premised on, and can be understood by, their values and interests — their subjectivities -- and agentic actions (Somerville 2002) which are a product of their life histories or ontogenies (Cole 1998; Scriber 1985); and can result in particular ways of knowing (Billett 1997).

So, rather than being situationally determined, conceptions of the invitational qualities of workplace affordances reside with the individual, as Gibson (1969) proposes. The invitational qualities are not objective; rather, individuals construct them as they engage in the work practice (see Figure 2). There is an independence of individuals acting within the interdependence of the social practice of work. Individuals' ontogenetic development likely will result in unique dispositions, ways of knowing

and knowledge (Billett 1997; Newman et al. 1989). This development arises from different degrees of interdependent participation in work of different kinds throughout their ontogenies. In sum, it is highly unlikely that uniformity in either engagement in social practice and inter-psychological processes, or the intra-psychological outcomes will arise from individuals' participation in workplaces. Their vocational practice and ways of knowing, arise as a product of their participation and experiences through a working life. Ultimately, individuals' knowing (i.e. learning, problem-solving and adaptability) is a product of the unique socially derived histories acting in work practices that are themselves transforming.

Co-participation as an explanatory base for learning through work and working life

The concept of 'co-participation at work' advanced here aims to help understand the process of learning throughout working life. It also provides a means to consider the relations between cognitive and social contributions to thinking and acting. Sources of knowing for work are constituted historically, culturally and situationally. In coming to know or learning this knowledge, the relations between the social and the cognitive are manifold, yet they are mediated socially, in the form of personal histories. In understanding the nature of inter-psychological processes, there is a need to account for the mutuality and interdependence among the sociohistorical genesis of knowledge and how particular circumstances afford the mediation of this knowledge (and therefore knowing), as well as how individuals' unique — albeit socially derived — ontogeny influences their participation in and learning through work-related activities. Through these bases, some relations between individuals' knowing and the social world are proposed. The interdependencies of co-participation have been used to suggest relations between history and ontogeny — that is, knowing as a reciprocal process occurs more than twice (once on the social and once on the individual plane), but iteratively between the two. Inter-psychological processes are interdependently relational, albeit situated in particular social action. Accordingly, the concept of knowing as something that is outreaching and fluid, rather than internal and fixed (acting on), is important. This positions sociogenesis as being negotiated, relational and interdependent by degree, as individuals are more than a mere element in the socially distributed cognition, and may at times be quite independent from the particular social system. Through their agency, individuals determine how they act, albeit constrained in some ways by the privileging of the social practice (its affordances). These affordances may not be accepted by or interest the individual, or entice them to appropriate what is afforded. Yet this agency is generated in another socially sourced contribution — the individual's life history.

In these ways, the concept of co-participation at work aims to advance a more relative interdependent view of knowing or learning through working life. This account is never more salient than when workers are constantly being expected to take responsibility for the currency of their work-related knowledge (OECD 1998), or when employers are avoiding their traditional responsibilities to assist this development (Carnoy 1999). It may assist understand the difficulties individuals encounter

in maintaining their vocational currency. While individuals are active agents throughout their working life (not the least in how they know and how they extend their ways of knowing), how workplaces afford opportunities to participate in different kinds of goal-directed activities and engage in interactions plays a central role in what they come to know and extend their ways of knowing. This engagement is, at least in part, premised on the relatedness between the norms of the social practice and individuals' value and beliefs. So the conceptual significance of co-participation at work can be seen as illuminating relations between the social world and the individual's development as an intersection between the trajectories of the constantly transforming social practice of the workplace in which individuals engage and individuals' evolving ontogenies as they participate in different kinds of social practice. Necessarily, this task needs to commence with identifying, detailing and understanding the nature and consequences of these relations. A consideration of working life as co-participation may support this endeavour.

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