Developing workplaces as learning environments: 
Towards a learning curriculum

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This paper draws on a program of research into workplace learning to advocate an approach to the organisation of workplace experiences aimed at making workplaces effective learning environments. The program of research, conducted in the coal, transport, secondary processing, retail and other industries, aimed to determine how individuals learn through participation in everyday work practice and how arrangements might be structured in workplaces to provide access to the types of knowledge required for vocational expertise. From these studies and associated inquiry the notion of the learning curriculum (Lave, 1990) is used to guide thinking about developing expertise in workplaces. This approach is premised on organising guided participation in the everyday activities of the workplace, while moving from a peripheral to a full role in the activities of the workplace. The literature which underpins the arguments in this paper represent a convergence between cognitive and sociocultural constructivist perspectives. The paper addresses issues associated with: the types of knowledge required for vocational expertise which are viewed as goals for learning; a view about what learning is; the potential and weaknesses of the workplaces as learning environments and a model of a learning curriculum is advocated. It is proposed that these ideas will contribute to discussions on adults and literacy learning.

1. Introduction
This paper aims to contribute to discussions about how the construction of the knowledge required for literacy by providing a view of learning and the goals for learning through participation in social practice. The kinds of social practice referred to in this paper are workplaces and the paper offers an analysis of potential contributions and limitations of workplaces in assisting the forms of knowledge required for competence or capability (expert practice) in those particular settings. Initially, goals for learning are advanced in the forms of

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1. This paper draws on work presented at the New Prospects for Vocational Education and Training, 1-4 May 1996 National Taiwan Normal University, Taipei, Taiwan. ROC and 6th Annual Workshop on TAFE teacher Education at Coffs Harbour 30 September - 1 October 1996.
knowledge which underpin and permit expertise. That is the ability to use these forms of knowledge to secure goals associated with non-routine problem solving in particular social practice. Next, a view of learning as problem-solving is advanced which holds that ongoing thinking and acting while engaged in everyday activities is how individuals construct knowledge. Hence, learning is not restricted to or privileged by particular social practice (e.g. schools, TAFE, university) but is a product of thinking and acting in any environment. Given that the construction of individuals’ knowledge is influenced by engagement in goal-directed activity (thinking and acting) in particular circumstances, the circumstances of those activities are held to influence the construction of knowledge as the activities and goals of such activities are a product of the particular social practice (Billett, 1995b). Next, the strengths and limitations of workplaces as environments in which to learn the forms of knowledge required for expertise are synthesised from a series of studies into workplace learning. Leading from this, a view of a workplace learning curriculum is advanced. It is hoped that such ideas will advance discussions about how the construction of adults literacy knowledge might best be realised. The ideas presented here are seen as being sympathetic to the view of ‘meaningful context’ advocated by Sticht (1987) as being responsible for impressive gains in reading ability by marginally literate adults. The analysis within this paper engages and links two constructivist perspectives - cognitive psychology which addresses forms of knowledge and their deployment in problem-solving and sociocultural theory which addresses the social source and basis for the construction of knowledge.

2. Goals for learning
Before discussing learning or the efficacy of particular curriculum practice it is necessary to propose a view about the forms of knowledge that are the goals for learning. Through an understanding of these goals it is possible to advance views about approaches to the construction of knowledge. Representations of knowledge in memory underpin how individuals think and act according to cognitive theory (Anderson, 1982). These representations, described as cognitive structures, comprise propositional and procedural forms of knowledge, and the interlinking and organisation of those structures into sets of schemata (Stevenson, McKavanagh & Evans, 1994) which is associated with the efficacy of thinking and acting in particular circumstances. Higher orders of procedural knowledge (Stevenson, 1986a) or executive strategies (Evans, 1991a) and deep layers of conceptual knowledge (Evans, 1991b) assist in the construction and effective deployment of schemata.
Propositional knowledge or knowledge "that" (Ryle, 1949), also termed declarative knowledge (Anderson, 1982), comprises facts, information, assertions, concepts and propositions. This kind of knowledge comprises levels of stateable facts or concepts (Evans, 1991b), ranging from simple factual knowledge (e.g. spelling, nouns,) through to deeper levels of conceptual knowledge (such as grammatical structure and language). Depth of understanding includes the strength of relationships among concepts (Groen & Patel, 1988; Novak, 1990), thereby emphasising interconnectedness as a basis for deep understanding (Prawat, 1989). The ability to effectively categorise, and hence solve complex problems, is a hallmark of expertise. Anderson states that the "ability to perform successfully in novel situations is the hallmark of human cognition" (1982, p.391). Novel tasks often requires the problem-solver to go beyond the surface features of a problem situation in order to access its deep features (Chi, Feltovich & Glaser, 1981; Gott, 1989). Therefore, deep conceptual knowledge facilitates the resolution of complex problem-solving, such as the transfer of knowledge to novel situations (Pea, 1987; Royer, 1979). Conceptual knowledge, within a domain, also provides a basis for determining what is salient or trivial in problem situations, thus aiding their resolution. Hence, a body a deep conceptual knowledge, within a domain, seems necessary for expert performance (Chi, et al., 1982).

Procedural knowledge (Anderson, 1982), also termed "knowledge how" (Ryle, 1949), enables skilful action and comprises techniques, skills and the ability to secure goals (Stevenson, 1991). It has been classified into levels or as Stevenson (1991) proposes three levels of orders. First order or specific procedures are employed to achieve specific goals. Being specific only to routine situations, these procedures are not purposeful when non-routine or ill-defined tasks are encountered. Consequently, monitoring, evaluation and strategy selection - the second-order procedures - are invoked. The second order includes those needed for breaking the task up into a series of sub-goals (Greeno & Simon, 1988) and engaging in means-end analysis (Newell & Simon, 1972). First and second orders are managed by forms of third or higher-order procedural knowledge, which act upon lower orders of knowledge, by monitoring and organising activities, and by switching between orders, when necessary (Evans, 1991a, Scandura, 1982; Stevenson, 1991).

Therefore, the role of higher order procedures is particularly important in thinking processes associated with non-routine activities, such as complex problem-solving (Gott, 1989) and the transfer of knowledge to novel situations (Royer, 1979; Stevenson, 1991). Higher order procedures monitor performance during problem resolution and predict likely outcomes of performance, thus consciously guiding action in a way quite different from that enacted through the deployment of automated
specific proceduralised knowledge. For example, while higher order procedures allow an expert to focus on novel aspects of the problem, if the solution does not begin to unfold as is expected, the monitoring will suggest that perhaps an incomplete diagnosis has occurred. The writer whose planned approach fails to secure clarity of argument, re-examines the work and proposes other strategies for securing the desired clarity.

Having considered cognitive structures in terms of deepening layers of propositional knowledge and orders of procedural knowledge, a gap becomes apparent in the cognitive literature - the dispositions which underpin these representations and their schematic linkages and organisation. For instance, how can being pleasant to customers in a retail or restaurant setting, or the appropriateness of the level of checking and self-monitoring required for a written assignment or report be categorised? **Dispositions** comprise the attitudes, values, affect, interests and identities (Prawat, 1989) which underpin thinking and acting. Perkins, Jay and Tishman (1993a, 1993b) regard dispositions as individuals' tendencies to put their capabilities into action. Although the role of higher order procedures - knowing how and when to apply knowledge - has been acknowledged above, this does not adequately account for dispositions - putting capabilities into action. Higher order procedures are concerned more with the efficacy of securing goals, than with whether the learner thinks they are worth securing (Dweck & Elliot, 1983; Goodnow, 1990; Tobias, 1994) or whether individuals possess the personal confidence or motivation to proceed with the task (Belenky et al., 1986).

Whether individuals value a particular form of knowledge enough to be willing to participate in the effortful activity required to secure that knowledge is dispositional, which has direct implications for the learning process and its outcomes. Therefore, dispositions need to be viewed as being inherent, underpinning but not separate from cognitive structures, thereby influencing cognitive activity such as knowledge construction and deployment. Moreover, dispositions are likely to be influenced by social and cultural factors experienced through individuals’ personal history.

3 **A view of learning as problem-solving**

Problem-solving is central to thinking and acting, and is advanced as being how individuals learn. Reference to problem-solving needs to includes distinctions between responses to routine and non-routine problems. For example, decisions about what clothes to wear or what route to take are problem-solving activities. The tasks of choosing among sets of work clothes or routes to work are routine problems, because they are easily addressed. However, choice of clothes to attend an interview, or social occasion, or the route to an unfamiliar part of town, may present a novel situation.
The former problems are routine as the variables are known, thus making a solution choice relatively easy. However, in non-routine situations not all variables are known, so individuals recall similar situations from the past to establish a basis for decision-making, all of which may require access to conceptual understanding and higher procedures. With routine problems, schemata are deployed to resolve the problem, requiring little conscious or effortful engagement of cognitive structures. However, small adjustments or manipulations which require conscious effort may be needed, when the existing knowledge is not directly applicable to new situations. So responding to non-routine problems is a major function of conscious, controlled thinking, and is now being associated with learning (Anderson, 1993; Shuell, 1990) and transfer (Royer, 1979). On the other hand, ongoing routine problem-solving activity reinforces knowledge. Together, these activities contribute to what Rogoff (1990) refers to as microgenetic development, the moment by moment learning that occurs through engagement in socially determined activities. That is, ongoing thinking and acting (problem-solving) is associated with how individuals construct knowledge (learn).

However, the delineation between routine and non-routine is person dependent. What for one individual may be a routine problem could be novel to another. Moreover, how individuals represent problems may determine whether they are treated as routine or non-routine, as individuals may turn a routine task into a non-routine problem (Simon, 1973). As problem-solving is set in social practice it engages cognitive activities with social sources because the activities and their goals are embedded in social practice. It has been determined that engagement in particular social practice has particular cognitive consequences (Billett, 1995a).

4. **Social basis for learning**

Only through gaining access to a real-life standpoint are individuals able to act meaningfully and purposefully as “situations might be said to co-produce knowledge through activity” (Brown, Collins & Duguid, 1989:32).

Individuals grow up in a social medium, and that their actions gain meaning as they exist and act in a medium of meaning and values (Dewey, 1916). He suggests that learning through engaging in real-life activities provides a rich basis for appropriating knowledge. Learning is therefore held to take place through situated activity using physical environments, the tasks they provide, the cooperative construction of knowledge among groups of social partners undertaking common tasks, and the culture of a community (Brown et al., 1989).

It is erroneous, to claim that formal learning institutions are ‘de-contextualised’ and furnish knowledge which is inherently transferable. These settings or communities of practice have
strong and pervasive cultures, with their activities being shaped by the requirements of the institution, which may thereby place limits on transfer to other settings (Billett, 1994b; Raizen, 1989, 1991; Rogoff & Lave, 1984). Situated learning challenges the separation of knowledge from how it is constructed and used, with situation being seen as inseparable from learning and cognition which suggests that settings referred to as formal institutions of learning are not necessarily privileged in developing participants’ knowledge. Circumstances are not neutral; they are an integral part of what knowledge is constructed (Brown et al., 1989; Lave, 1993; Lave & Wenger, 1991; Wertsch, 1993). Cross-cultural studies have examined the nature and consequences of learning which might be described as being authentic, such as navigation in Puluwat (Hutchins, 1979, cited in Scribner, 1984), construction work (Carraher, 1986), tailoring (Lave, 1977; 1990) and weaving in Zinacanteco (Childs & Greenfield, 1980). In the study of weaving, the skills developed were seen as being at least as transferable as those developed in schooling (Childs & Greenfield, 1980). That is, the knowledge and skills constructed through "informal" learning experiences were as robust and transferable as those developed through schooling. There is little reason to believe that participation in formal educational settings is inherently likely to generate knowledge that is robust and transferable. Rather it is the quality of the activities that individuals engage in, and their engagement with those activities which are likely determinants of whether robust and transferable knowledge is secured.

5 Workplaces as environments in which to learn

In this section findings from a series of studies into workplace learning (Billett, 1992, 1993a, 1993b, 1994, 1995a) are synthesised. These studies examined the consequences of participation in activities in the workplace as a means of securing knowledge and highlight some strengths and limitations associated with that participation. The key concerns are how the forms of knowledge referred to earlier can be constructed by engaging in problem-solving activities encountered as part of everyday workplace activities.

5.1 Strength of workplaces as learning environments

Participation in authentic workplace activities, guidance by expert others, other workers and engagement in tasks are seen as the basis for effective learning in workplaces (Billett, 1995a). The construction of the knowledge required for expert performance is apparently realised through learning experiences that are authentic, thereby providing goal-directed activity (problem-solving) which has cognitive consequences of particular salience for workplace activities. Close or proximal guidance by other workers in securing workplace goals is valued by learners. It is held that, everyday participation
in work tasks provides opportunities for learners to generate tentative solutions to tasks and then attempt to secure those solutions. This results in knowledge being indexed and organised in ways that is purposeful in terms of the successful securing of workplace goals. This guided approach to learning provides the opportunity for learners to develop increasingly mature approximations of the procedures required to be successful in these tasks, through a process of testing and modifying their approximations. As these procedures are tested and modified it is likely that concepts associated with goals and subgoals will become deepened through rich associations, linkages and purposeful organisation. Over time, this ongoing activity results in the development of a repertoire of goal-securing schemata which are richly associated with the circumstances of their acquisition through routine and non-routine problem-solving. Indexing to the social environment provides a form of mediation which draws upon the social and cultural contributions (clues and cues) of the particular setting (Brown, et al., 1989).

The interaction with expert others guides the learners’ tentative solutions to tasks and the means of securing goals (Billett, 1994). Experts provide the means for achieving task goals, through proximal guidance and more distal contributions such as access to further practise and increasingly complex tasks. This proximal interaction is analogous to the modelling, coaching and scaffolding of the approach to learning referred to as cognitive apprenticeships (Collins, Brown & Newman, 1989) in what Vygotsky (1987) refers to as the Zone of Proximal Development. That is the array of the tasks that can be successfully accomplished with the assistance of an expert, which otherwise could not be accomplished, by learners on their own (see Appendix A for an elaboration of this approach to close guidance). Indirect or distal forms of guidance also provide sources of supplementary mediation for the construction of knowledge. For example, listening to and the observation of other workers in the workplace is reported to assist the learner with the conceptualisation and approximations of workplace tasks (Billett, 1994).

It is held that the active and constructive learner-focussed nature of engagement in workplace activities presses learners into goal-directed activity, is conducive to accessing higher orders of procedural knowledge and deeper conceptual knowledge, as well as the development of more specific forms of knowledge (Billett, 1993a; 1993b; 1994; 1995b). It is these forms of knowledge which are particularly useful for the transfer of knowledge to other circumstances. From a constructivist perspective, the active engagement in routine problem-solving activities affords another key quality -- reinforcement -- the satisfaction that individuals experience when they adapt new stimuli to their existing knowledge structure, or, put more simply, when they are 'making sense' of the stimuli (von
This is an important distinction between views which are premised on the nature of learning as being externally directed (e.g. behaviourists), where reinforcement is linked to external endorsements, and constructivist views where reinforcement is the internal gratification realised through making sense of a novel stimuli through a process of interpretative construction. From this view, as individuals construct knowledge they experience reinforcement as procedures become more effective, predictions are realised through monitoring, and task goals are achieved to a standard required by the culture of the particular workplace practice. In these ways, the above mentioned studies offer evidence of the potential that exists within workplaces for the development of purposeful vocational knowledge, a potential which can be realised through guided participation in everyday work practice.

5.2 Limitations of workplaces as learning environments
Although workplaces offer the potential for rich learning outcomes, through participation in everyday practice, they also have limits. Possible limitations to the effectiveness of workplace learning are synthesised as follows: (i) the construction of inappropriate knowledge; (ii) access to authentic activities; (iii) reluctance of experts; (iv) access to expertise; (v) opaqueness of some knowledge and (vi) access to instructional media (Billett, 1995b). Underpinning learning in workplaces is that they, like any other settings, are inherently value-laden. Values associated with the goals of the organisation (e.g. productivity, service) and of those individuals working the setting (e.g. personal or sectional interests) cannot be denied as they influence the nature, type and access to the activities which influence cognitive development.

5.2.1 Inappropriate knowledge
Inappropriate knowledge, including attitudes and values may result if these are present and rewarded in the workplace. For example, dangerous work practice or exclusive views about gender and race might be pervasive. Particular views privileged in the workplace are likely to be quite pervasive. As most forms of situated learning occur where relationships between participants are unequal (Verodonik, et al, 1988), the nature and values embedded in workplaces are likely to play a role in determining the types of knowledge that are constructed. Therefore, despite individuals ultimately constructing their own version of knowledge, the press of the workplace or desire to conform may result in deleterious learning outcomes. So, for example, dangerous or shoddy work practice might be appropriated because such practice is a workplace norm. Hence, there is the limitations that not all knowledge secured in workplaces will lead to expertise.
5.2.2 Access to authentic activities

The potency of learning is determined by the quantity and quality of guided access to authentic activities which press learners into problem-solving. If learners are denied engagement in activities which are increasingly challenging, it is likely that the learning outcomes will be constrained. Access to work activities need to be sequenced to take the novice from engaging in peripheral activities through to increasingly complex tasks. Moreover, those activities which allow the learner to access both the process and the product of those activities need to be included.

5.2.3 Reluctance of experts

Workplace environments in which learners are provided with models, coaching and insights are likely to provide rich learning outcomes. However, reluctance by experts to furnish these interactions may severely inhibit the outcomes of workplace learning. Expert workers may well be cautious about sharing their knowledge for fear of loss of status or even concerns about displacement, by those whom they have guided (Lave & Wenger, 1991). In Japanese corporations, where workplace learning is used widely, supervisors, whose roles include training subordinates, are secure in the knowledge that their promotion is based on seniority (Dore & Sako 1989). These experts provide learning experiences for their subordinates without concerns about displacement by those they have trained. Experts who are not rewarded or fear displacement may be unwilling to provide the proximal guidance and access to increasingly complex tasks which is essential for learners. A particular issue in the Australian context is concern about industrial affiliation in which particular jobs are undertaken by particular groups of workers. So, for example, a tradesperson may be reluctant to show a non-tradesperson a particular task, if they believe it may jeopardise the tradesperson’s interest.

5.2.4 Access to expertise

A lack of available expertise will be likely to have a negative impact upon workplace learning. Although expertise external to the workplace may be required to provide guidance, any external expertise has to account for the conditions under which work practice is conducted. For example, in one of the studies (Billett, 1993a), coal workers stated that the technical teachers at a nearby vocational college lacked an understanding of how work was conducted in coal mines. However, in another study (Billett, 1994a), novice staff worked alongside experts from overseas during the commissioning of a secondary processing plant. In doing so, these novices gained important understandings and insights which have allowed them to take responsibility for the plant's operation and to respond to problems that arise during production. Access to expertise is likely to be an
important factor in workplace learning, therefore limits to access could have negative outcomes. However, as is reported consistently in the studies, the learner determines who is and is not expert.

5.2.5 Accessing conceptual (propositional) knowledge

Concerns were reported in two studies (Billett, 1993a & 1994) about the inability of workplace learning activities to secure the depth of understanding required for complex work activities. Prawat (1993) also suggests that situated learning may favour the development of procedures over propositions. Such concerns need to be acknowledged because, as Berryman (1993) reports, the increasing complexity of work is making many tasks more opaque, requiring a rich conceptual base to understand and be effective in these more complex forms of work. The studies indicate that, despite the concerns of Prawat (1993) and some participants, propositional knowledge is developed through guided everyday activities in the workplace. However, close guidance and even intentional instructional intervention is likely to be required to develop understanding about knowledge that is opaque and hidden from the novices. For example, ‘black-box-technology’, computer-driven processes, forms of work organisation or even opaque concepts such as hygiene and contamination are making knowledge inaccessible. The conceptual knowledge required for this understanding is often inaccessible to the novice without proximal guidance of an expert.

5.2.6 Instructional media

Currently, much of the effort to manage learning in workplaces is grounded in the use of various forms of text-based instructional materials. These media, such as computer-based and text-based learning systems, are often proposed as training solutions for workplaces. However, it is reported that such media offer access to forms of knowledge that are disembodied from the activities for which they claim to be developing knowledge (Billett, 1994). The knowledge, so constructed, has to be transferred from the context of acquisition to application in the workplace in order for knowledge to be deployed. This is because the type of knowledge developed through interacting with these texts does not develop the types of knowledge required to secure goals in novel circumstances. In addition, these types of learning arrangements are most likely to be generative of certain types of knowledge, particularly very specific procedures and low-level propositional knowledge, which are not, of themselves, likely to assist with complex work performance.

Having advanced findings about the prospects for the construction of the forms of knowledge required for expert performance through everyday activities in the workplace, in the next section, a
Towards a model of workplace learning: the learning curriculum

The approach to organising a learning curriculum presented here depends upon access to activities that provide guided opportunities to engage in problem-solving that is conducive to generating the forms of knowledge outlined earlier. Consequently, engagement in tasks is viewed as being the basic unit of curriculum and the organisation and sequencing of those activities is central to the learning curriculum, such as has been advocated by Posner (1982). Lave's (1977) study of Liberian tailors' apprentices is particularly instructive when considering curriculum as participation in social practice. She demonstrates how authentic work activities mediate learning. The activities in the tailors' workshops are structured in such a way as to represent a hierarchy of tailors' tasks which apprentices have to learn. The garments produced by tailors also reflect values within Liberian society, which influences the tailoring activities with simple garments (undergarments and children's garments) requiring fewer skills whereas ceremonial garments requiring more complex skills and greater exactitude. These tasks provide the basis for the development of layers of understanding about the significance of tasks and conceptualisation of those tasks. This sequencing of activities is termed the learning curriculum by Lave (1990). For example, the first tasks undertaken by apprentices are finishing off and ironing completed garments. This permits apprentices to develop an understanding of what garment pieces look like as they are being ironed, and to observe the form and standard of the completed product. Apprentices also commence learning by assembling complete garments, such as under-drawers and shirts, and gain skills in constructing garments in situations where mistakes are tolerable.

The apprentices work on real garments assisted by an assortment of mentors, tailors and other apprentices in the workshop who provided guidance and modelling. Consequently, apprentices are able to monitor their own performance against that of other learners and enjoy direct and indirect guidance (Lave, 1990). There are also environmental clues such as completed or incomplete garments on which to model their work. Hence, as part of the learning curriculum, apprentices are also able to view both the processes and products of the workshop, which is conducive to the development of conceptual models. Lave (1990) also observes that little in the way of explicit teaching takes place. In these ways, her study emphasises the primacy of the authenticity of activities in which novices engage. These activities are organised in such a way as to provide movement from peripheral to more complex tasks; as well as access to observation, opportunities to develop mental models, and rehearsal on less critical activities and guidance,
most of which is indirect, from experts and other novices; and also clues from the physical environment. In addition, and perhaps in consideration of fully appropriating the values and norms of a tailor, apprentices live in master tailors' houses in a street full of tailors' workshops (Lave, 1977; 1990).

In another example, Carraher’s (1986) study, which compared the use of maths by construction supervisors with that of school students found that, the daily work experience of construction supervisors, despite their limited formal education, developed more complex and adaptive meaning structures, associated with maths, than those possessed by school students. This authentic, functional and socially embedded approach to learning is reinforced by the example of children’s’ language and interpersonal skills development, usually constructed in the home under the guidance of parents between the child's first and fifth year. The learning during these years has been described as “spectacular" by Bransford, Sherwood and Hasselbring (1985, cited in Pea, 1987), who conclude that children learn quickly with little explicit intervention and with little obvious effort. These authors report three characteristics of this spectacular learning process: firstly, the learning is in context; secondly, effective mediation is provided; and, thirdly, learning is functional.

The informative nature of authentic activities is exemplified in a recent study. A novice pallet-packer in a warehouse reported using the various configurations of pallet packing, which were all around him in the warehouse, as a library of possible packing configurations. When faced with a novel situation, he would use examples in the warehouse to assist decision-making about the most appropriate configuration (Billett, 1993b). It seems that authentic activities can be deeply informative, in a way that textbook examples and declarative explanations cannot be (Brown et al., 1989).

From the foregoing, it is held that the potential strengths of learning through engagement in socio-culturally authentic activities reside with novices being able to observe both the process and product, and also develop richly interlinked conceptual representations. Novices, while undertaking authentic activities, may have access to proximal and distal sources of guidance such as a range of experts and the cues and clues provided by the workplace. They can monitor themselves against other learners at different stages of development, and watch and participate as tools are used, and standards are stated both explicitly and implicitly. Novices are also pressed into decision-making within their Zone of Proximal Development (Vygotsky, 1987) and provided
with feedback on how to achieve increasingly more mature approximations of expert-modelled tasks (Collins et al., 1989). Learners are able to conceptualise what they are doing as part of the totality of task completion and have to confront practical problems in realistic settings and conditions which are functional, embedded and purposeful in a way that abstracted, substitute or simulated activities can never be. That is not to say there is no place for substitute or simulated activity as long as their limitations are recognised.

In order to formulate a framework for the learning curriculum it is necessary to draw on the work of Lave (1977, 1990) and some of the findings of the workplace learning studies (Billett, 1993a, 1993b, 1994a, 1995). From this work it held that, the organisation of the learning curriculum needs to be linked to: (i) movement from peripheral to full participation in workplace activities; (ii) access to the product (goals) of workplace activities; (iii) proximal guidance from more expert others; and (iv) distal guidance provided by the physical as well as the social environment (see Figure 1).

6.1 movement from peripheral to full participation in workplace activities

It is necessary to identify a pathway of vocational tasks and activities which workplace learners need to access and move through to become competent (full participant in the workplace). Delineating this learning pathway is used to determine how workplace learners can move from the work activities undertaken by novices to those of experts. This pathway is founded on movement from peripheral activities to full participation in work activities - that is, from those activities which are less accountable and complex, to those which are usually more complex and may carry greater accountability (see Lave & Wenger, 1991). The development and sequencing of this pathway of activities need to accommodate two general requirements. The first is the sequencing of workplace activities that are of increasing complexity. This permits the learner to participate in incrementally more accountable, tasks and goals in the movement from peripheral to full participation in workplace activities. This necessarily involves engagement in routine and non-routine activities. Secondly, the pathway has to afford learners the opportunity to access the procedures and processes, and importantly, the products of workplace activities. This means that, early in these activities, opportunities must exist for learners to access and understand the outcomes of their work activities. This access enables the development of understanding about the goals and standards of those activities. It is quite likely that such structures will already exist in workplaces.
So, the sequencing of workplace activities that are of increasing complexity permits the learner to engage in movement from peripheral to full participation in the workplace. Such a pathway does not need to be a fixed sequence of activities to be undertaken in a step-by-step fashion. Rather a grouping of activities which can be accessed and undertaken by learners as opportunities arise in everyday workpractice. Movement through the pathway is likely to be premised on the ability of the novice to be able to successfully complete the tasks without the proximal guidance of the expert other.

6.2 access to the product (goals) of workplace activities

Secondly, the pathway has to afford learners the opportunity to access both the product and the process of the workplace activities. This means that within the learning pathway there has to be opportunities for learners to access and understand the outcomes of their work activities. This access permits the development of understanding about what their activities are contributing towards and set standards associated with those activities. For example, in one of the earlier studies (Billett, 1993b) it was reported that, as part of their training, warehouse workers were taken in a delivery truck to supermarkets to see the goods they had packed onto pallets being delivered. This experience allowed these workers to appreciate the importance of care and thoroughness in packing the pallets to withstand the rigours of long road journeys and the importance of arriving in a presentable condition. Making the goal accessible provides important goals for vocational practice, which become goals for learners.
Constructing the Learning Curriculum
Adapted from Lave, 1977, 1990)

Peripheral participation ——— Distal Guidance
(physical setting, observation, listening)
——— Full participation

Proximal guidance ———
activities ———
Access to goals ———

Proximal guidance ———
activities ———
Access to goals ———

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6.3 Proximal guidance from more expert others

The investigations into workplace learning, referred to above, emphasised the importance of learners' interaction with expert others in the development of skilful knowledge. Access to experts was consistently valued highly. There would be no guarantee that someone entitled 'the trainer' or nominated workplace mentor would be granted this status by workplace learners. A model of guided learning which can be used by workplace experts, is cognitive apprenticeships (Collins, Brown & Newman, 1989). This approach to guided learning, seems particularly applicable for use by expert others to make potent proximal guidance. The cognitive apprenticeship model aids the development of learners' self-monitoring and self-correction skills, and the integration of the skills and conceptual knowledge required for expertise. This approach to guiding learning, which comprises (i) modelling, (ii) coaching, (iii) scaffolding and (iv) fading, is described in Appendix A.

6.4 Distal guidance provided by the physical as well as the social environment

The on-going everyday activity which engages workplace learners in both routine and non-routine problem-solving provides the basis for the development of vocational knowledge. Indirect guidance is part of this experience which includes learners listening to and observing other workers. Models of practice, and standards by which learners can measure their progress against, are provided by this indirect form of guidance (Lave, 1990). Equally, the structuring of experience by the workplace and the cues and clues provided by the physical environment provide another form of distal guidance.

In the studies mentioned above, it was evident that the sharing of knowledge within organisations varied. Those organisations in which workers enjoyed broader discretionary roles and had limited barriers to work practice appeared to offer richer learning environments. These four dimensions of the learning curriculum provide a basis for vocational educators to develop workplaces as learning environments able to secure the knowledge required for full participation.

5. Conclusion

This paper has proposed a view of learning as participation in social practice rather than arrangements for teaching. This is are not a trite distinction. There is a need to capitalise upon the contributions to learning which are provided in social practice, such as workplaces and attempt to inhibit the shortcomings identified in recent research. The tasks associated with developing the learning curriculum may not be difficult. For example, the procedure to delineate the learning pathway might be as simple as determining the sequence in which experts believed they
constructed their skills and compared this with the experiences of recent learners. An analysis of this data might then be used and refined in order to generate the most effective learning activity pathway, and the structuring of the opportunities so that the pathway provides the access to both the process (means of securing goals) and the product (what those goals might be). The identified pathway can be used to manage the sequencing of tasks which novices will have to access. An approach to constructing the learning curricula is likely to follow a pathway which seeks to determine: (i) what it means to be a full participant in a particular practice (what defines an individual who is expert in the practice); (ii) what are the areas of knowledge to be constructed by novices; (iii) what is the sequence in which this knowledge has to be constructed; (iv) what areas are difficult to learn about (complex, opaque) to focus proximal guidance) and what goals for performance need to be constructed on the pathway. Such an analysis will generate rich information about vocational tasks and the knowledge likely required for literacy, their relationship to a particular workplace and also how a learning curriculum might best be established.

In sum, this paper has advocated a view of curriculum associated with engaging in social practice. This view situates the development of curricula within a particular practice and through guided participation in that social practice. Drawing on constructivist views it is advocated that the construction of knowledge is an individual process, albeit embedded in and extricably associated with a workplace. That association includes a reciprocal relationship between the individual and the environment in which to engage in activities. In establishing a pathway of experiences, a learning curriculum is advanced which takes account of both direct and indirect guidance and the engagement in activities which are potentially generative of robust knowledge. It is hoped that the findings of research and ideas presented in this paper will make some contribution to the development of understanding of the development of adults’ literacy knowledge.

References


Appendix A - Model of proximal guidance

Modelling is the process whereby the expert executes a task with learners observing and building a conceptual model of what is being demonstrated which assists learners to successfully accomplish the task. However, it may require the externalisation of the internal (cognitive) procedures that experts deploy when utilising their procedural and conceptual knowledge. Experts may need be instructed to verbalise their thinking to assist learners, eg. - "the reason you place the pin in first is to .." "if the gauge comes up too quickly it means that... "what I am considering at this point is...
Observation allows learners to observe task completion and be offered an account of how the expert went about the activity. An important quality of effective modelling is to make accessible any knowledge which is opaque. Therefore, experts may need to use analogies, explanations, diagrams or probing questions to make accessible to the learner that knowledge which is not accessible by visual means.

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<th>Modelling</th>
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<th>Scaffolding</th>
<th>Fading</th>
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Coaching is the process of observation and monitoring by the expert as learners carry out activities. Experts will offer hints, feedback, clues and demonstrate tricks of the trade to assist learners achieve desired outcomes. Coaching may also involve repeated demonstrations of a task, or part of the task. Supportive comments are also part of the coaching phase. Asking learners to consider where else they can use a particular procedure or suggest changes in approach given the different application of a procedure or process "If you were packing a pallet with a new type of box what would you need to do?". Coaching may also serve to direct learners' attention to aspects of the task that is known, but temporarily overlooked. Coaching interaction is usually immediately related to specific events or problems that arise as learners attempt to achieve the target task. The intended outcome of the coaching process is to guide learners' performance to become closer to that of the expert so that learners' approximation of tasks becomes increasingly mature (Gott, 1989).

The on-going support that experts provide is referred to as Scaffolding. This support takes the form of providing learners with opportunities to acquire knowledge and skills that are within the scope of the learners' ability. Additional suggestions or help, take the form of supports such as general reminders which might comprise scaffolding. "always start at the centre back and measure down from there and then move down from the chest to the waist and hips". Scaffolding may require the expert to carry out a part of the overall task that the learner cannot yet manage. Scaffolding offers a co-operative basis to problem-solving between the expert and the learner in which the express intention is for the learner to take as much of the responsibility for the activity as possible. A requisite for such scaffolding is an accurate
appraisal, by the expert, of the learner's current skill level and the difficulty of the task. Finally, **Fading** consists of gradual removal of support until learners are able to conduct the task autonomously. This more distant support might lead to decisions about providing opportunities to engage in a range of more complex tasks. The development of experts' ability to use the strategies associated with cognitive apprenticeships, some of which they are probably using intuitively, is a useful undertaking.