Drawing on a series of studies into workplace learning, this paper examines the basis for
organising workplace learning experiences for the development of vocational expertise. It is
argued, from a constructivist perspective, that the structuring these experiences has four
dimensions: (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. Instead of an
emphasis on teaching, the development of a learning curriculum is advocated which takes into
account the four dimensions outlined above thereby placing a focus on learning and curriculum as
a set of structured everyday activities. It is held that, through guided everyday experience in the
workplace, a pathway of activities can be established through which participation can lead to
the development of vocational expertise. Each of the dimensions of the ‘learning curriculum’ are
seen as being salient and interrelated. In particular, it is argued that as forms of vocational
knowledge become more complex, with the increased application of technology and more
elaborate forms of work organisation come to be used, that close guidance of expert others
become a necessary quality for the development of vocational knowledge. The paper concludes
by advocating the development of ‘learning curriculum’. It is intended that such structures can
become the basis for organising, developing and evaluating workplace learning experiences.

1. Introduction
Currently, theoretical developments are pressing for a re-examination of how curriculum should
be conceptualised. Firstly, in the search for a more complete understanding of how individuals
think and act, a convergence of cognitive and sociocultural constructivist theories is occurring.
From this convergence the interaction between the social sources of knowledge and individuals’
construction of knowledge is now being viewed as being interpretative and problematic, rather
than something which can be viewed as an objectively definable outcome. Secondly, learning is
now being conceptualised as the process and outcome of ongoing participating in everyday
activities within a particular social practice. Referred to as appropriation (Rogoff, 1995) this
process is viewed as being an active, reciprocal and constructive process associated with
engagement in socially determined activities. The focus of learning is, therefore, associated with activity (Leontiev, 1981) and the forms of guidance provided by both situation and social partnerships, which are themselves premised on historical, social and cultural factors (Wertsch, 1993). Consistent with this view is that engagement in routine and non-routine goal-directed activity is associated with learning, because these activities press learners into the transformational process of appropriation. Thirdly, the situated nature of knowledge construction emphasises engagement in a particular community of practice which underpins concepts such as expertise, domains of knowledge and moment from novice status to full participation in a community of practice.

A community of practice is defined as a “set of relations among persons, activity and world, overtime and in relationship with other tangential and overlapping communities of practice” (Lave & Wenger, 1991:98). Workplaces are communities of practice, so are schools and colleges. Novices and experts are defined on the basis of their participation in the community of practice as being peripheral or full (Billett, 1995). If learning is associated with engaging in activities in particular social practice and that movement from being a peripheral participant to being a full participant is associated with becoming competent in increasingly complex or more accountable activities, then this sets out a basis for considering a conceptualisation of curriculum as a sequence of activities structured in such a way as to secure the goal of full participation. Hence, concepts such as competence or expertise are now being seen as being highly situational. Taken together these views press for a consideration of curriculum as something individually constructed, socially mediated and situated within a community of practice.

This paper argues that when considering the development of vocational expertise (full participation), from a constructivist perspective, that it is necessary to conceptualise curriculum as something which is organised to permit and guide the construction of desired knowledge by individuals. In the case of vocational education, the development of expertise can be thought about as participation in authentic vocational activities that will result in the appropriation of the knowledge required for expertise. This orientation acknowledges the individual as an interpretative active participant in the transformative process of constructing knowledge. Structuring the experiences, and hence the activities for the learner provides a way of thinking about curriculum from this perspective.
To address these issues this paper, firstly, argues that the appropriation of knowledge is an interpretive, reciprocal and constructive process that occurs through routine and non-routine problem-solving within a community of practice. Secondly, that communities of practice have a complex of structures and organisation (an activity system) which gives a particular structure to participation. Next, the concept of a learning curriculum is advanced drawing on Deweyian antecedents and elaborating with more recent theorising from the sociocultural literature. Fourthly, the dimensions of the learning curriculum are elaborated upon, drawing upon recent research into workplace learning. The final sections argue a case for how the learning curriculum might be constructed and implemented.

2. Learning - appropriation of knowledge through participation in everyday activities

Dewey (1916) proposed that 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. In this way, he suggests that learning through engaging in real-life activities provides a rich basis for appropriating knowledge. 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). It is claimed that effective learning takes place through situated activity using the physical environment and the tasks it provides, the co-operative construction of knowledge among groups of workers undertaking common tasks, and the culture of a specific work community (Brown et al., 1989). However, current views are different from what was central to earlier ideas about learning.

For example, Bartlett (1958) and Bruner (1966) propose that schools and learning processes should be decontextualised, thereby freeing learners from the shackles of a particular time and place. This view is sympathetic to a belief that general thinking processes, which could be applied universally, should be the main goals of education (Edwards, 1991). Experiences which promote the development of logical and rational thinking processes are favoured in this view - for example, the use of chess and Latin. The removal of "unnecessary" distractions, was undertaken in order to develop deeper and more general thinking processes (Bruner, 1966). However, performance in actual contexts is demanded and it is about that performance which judgements ultimately are made. There is little evidence to suggest that the teaching of Latin and chess are effective in developing general thinking skills. Rather, it seems they taught the specific skills of Latin and chess (Glaser, 1990).
Moreover, it is clearly erroneous, to claim that formal learning institutions are ‘de-contextualised’. 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 acquired and used, with situation and setting being seen as inseparable from learning and cognition. 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 acquired through "informal" learning experiences were as robust and transferable as those developed through schooling. Significantly, the skills acquired through engagement in culturally authentic activities are not peripheral; they are crucial to the survival of individuals and their cultures. In addition, there is little reason to believe that somehow the activities that learners participate in formal educational settings are inherently likely to generate knowledge that is robust and transferable. These settings need to be considered as another form of social practice, which may not be privilege the development in the development of transferable knowledge. 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.

Lave's (1977) study of Liberian tailors' apprentices is particularly instructive when considering conceptualisations of curriculum as being 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, with simple garments (undergarments and children's garments) requiring fewer skills whereas ceremonial garments requiring more complex skills and greater exactitude. The tasks undertaken by apprentices are, therefore, a manifestation of a hierarchical social ordering and structuring of activities. 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 through a hierarchy of successively more complex garments, which represents the social hierarchy of tailoring activities.

The authenticity of the tailoring learning curriculum provides other contributions to learning. 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. 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 acquired 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 the 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. However, these attributes, although socio-historical and cultural, can only be accessed in particular social practice, which themselves are shaped by a complex of social factors, and, as such, are functional, embedded and purposeful in a way that abstracted, substitute or simulated activities can never be.

Yet, commentaries often characterise on workplace learning settings as being "informal", ad hoc, concrete and incidental (Marsick & Watkins, 1990; Resnick, 1987; 1989) and are sometimes accompanied by concerns about the types of knowledge being generated (Evans, 1993; Prawat, 1993). These characterisations appear far from accurate, as the workplace learning curriculum is such that novices may experience a highly organised and structured learning setting. Claims of "ad hocery" are sometimes used to dismiss learning arrangements in places other than formal learning institutions (Resnick, 1987). Yet defining engagement in authentic activities as being
unplanned learning activities, which are incidental (Marsick & Watkins, 1990) is misleading and inaccurate. The proximal social relationships - for example between master and apprentice - provide a basis for collaborative problem-solving and decision-making. These activities take place in socially structured circumstances which are not adhoc. They are structured for particular reasons. Neither are the consequences of collaborative problem-solving incidental. These are structured and potentially potent attributes of the learning setting.

The shaping of this body of contextualised knowledge is held as being derived from activities and practices within social practice. These contributions to learning have been characterised as developing understanding through practice (Lave, 1990). Having advanced a view about the nature of appropriation, in social practice, in the next section an analysis of communities and concepts of practice is advanced in order to delineate the ways in which they are shaped and influenced.

3. Nature of particular social practice
As argued above the particular community of practice provides the most likely source of understand the social basis for the construction of knowledge because notions of expertise and performance are likely to be highly situational. As a study of hairdressers has shown what was taken as expertise in one community of practice would have been rejected as indulgence in a second, inappropriate in a third and alienating in a fourth (Billett, 1995). So although there are attributes of performance which transcend settings there are also elements which can only be judged in the circumstances of their deployment. It would seem that those aspects which transcend settings (e.g clients servicing - haircuting techniques) inform the application of more specific refinements at the community level (e.g type of service - preference for techniques). What this means is that, while these more broadly applicable forms of knowledge are essential, on their own they are not sufficient. They have to be complemented by knowledge which secures goals at the community of practice level. Therefore, concepts of curriculum need to address the particular requirements of the community of practice to develop expertise, thereby also facilitating the construction of knowledge that is robust and has transferable aspects.

As also argued above, social relationships are central to guided learning in social practice. Although Lave and Wenger (1991) view all participants in social practice as being peripheral, given the changing nature of practice, there is evidence that not all participants are equal in status. Indeed as Verodonik et al.(1988) reminds us every instance of situated learning occurs in unequal
social circumstances. There is evidence that those in a principle role within a community of practice (e.g. supervisors/owners) are able to make decisions which influence the trajectory of experiences that both novice and expert participants can engage in (Billett, 1995). Consequently, it is necessary to delineate at least three categories of participants. Firstly, there are peripheral participants (novices or neophytes) who are seeking to become expert in the practice in order to enjoy the autonomy and status in their participation. Secondly, there are full participants, who are able to undertake the tasks which carry greatest accountability and solve problems which are non-routine. In cognitive psychology these would be referred to as experts. Thirdly, there are principle participants, who command a position of influence in the community which is able to determine how and why things are done and influence the nature of other participants engagement in the practice. Full participants has a role in providing guidance and support, whereas principal participants can influence the nature of those experiences.

4. Conceptions of the learning curriculum

The view of curriculum as a series of activities it not a new idea. As advanced above, the pragmatist Dewey has advocated a view about engagement in everyday activities. Moreover, from an anthropological view Lave (1977, 1990) has demonstrated how the structures provided by social practice has laid a pathway of experiences, naming it the learning curriculum. Posner (1982) argues that the task individuals engage in structures what is information is selected from a situation and how that information is processed. Tasks are held as determining the activities which the learner experiences. Like later views, Posner(1982) emphasised that individual constructions are likely to interpretative, that are person-dependent.

Moreover, studies in workplace learning have provided evidence about the strengths and limitations of learning in workplaces through everyday activity (Billett, 1993a, 1993b, 1994a, 1995). These studies provided evidence of the process and outcomes of guided participation in everyday work practice. What they did indicate was that knowledge that is hidden, which is increasingly becoming the case with the advent of technology and complex forms of work organisation (Berryman, 1993), need to be made accessible to learners. Moreover, there is knowledge which by its very nature is inaccessible yet needs to be understood (e.g. virus, bacteria for health workers, force factors for construction workers). Sometimes this knowledge is referred to as theory. However, if this knowledge is viewed as propositional knowledge it may take away the stigma of theory not being related to practice. It is doubtful whether skilled
workers think about their propositional knowledge as theory. Yet it is an array of principles, propositions and facts which is required for expertise.

5. Dimensions of the learning curriculum

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. From this work it held that, from a constructivist perspective, the structuring 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.

5.1 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. 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 the principle of 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). So, the sequencing of workplace activities that are of increasing complexity will permit the learner to experience incrementally complex tasks and goals in the movement from peripheral to full participation in the community of practice. 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 they 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.

5.2 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. It is the sequencing of the tasks which need to be delineated and developed as well as making judgements about how best the characteristics of the learning curriculum can be ascertained

5.3 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. Consistently, in the three studies, access to experts was consistently highly valued. However, the workers that were learning decided who possessed expertise. Those workers who were acknowledged by others as being experts were seen as credible sources of knowledge. There would be no guarantee that someone entitled 'the trainer' or nominated workplace mentor would be granted this status by workplace learners. Knowledge is socially sourced, therefore the guided support provided by more expert others is highly influential. A model of guided learning which can be used by workplace experts, is cognitive apprenticeships (Collins, et al., 1989). This approach to guided learning, which includes modelling, coaching, guidance and fading, seems particularly applicable for use by expert others to make their guidance of workplace learner potent. 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 below.

**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.
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.

5.4 distal guidance provided by the physical as well as the social environment
The on-going everyday vocational activity which engages workplace learners in both routine and non-routine problem-solving is the basis for the development of vocational knowledge. This on-
going experience is essential for the development of robust 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 community of practice and the cues and clues provided by the physical environment provide another form of distal guidance. However, it is within this area that a key limitation of workplace learning can be found. There may well be a reluctance for some experts to share their knowledge and also barriers for learners seeking to accessing the learning pathway. In Japanese corporations supervisors pass on their knowledge to subordinates, confident in the knowledge that as promotion is based on seniority there is little prospect of their being displaced by those to whom they have assisted (Dore & Sako, 1989). 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.

6. Conclusion: constructing the learning curriculum

The procedure to delineate the learning pathway might be as simple as determining the sequence in which experts believed they acquired 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. However, this pathway is likely to be influenced by situational factors as the requirements for practice are likely to differ across settings. 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 acquired by novices; (iii) what is the sequence in which this knowledge has to be acquired; (iv) what areas are difficult to learn about (complex, opaque) to focus proximal guidance) and what goals for performance need to be acquired on the pathway.

Such an analysis will generate rich information about vocational tasks, their relationship to a particular community of practice and also how a learning curriculum might be established. In
doing so, it advocates curriculum intent, formulates a set of experiences to achieve these intents and provides a means to determine if such a goal can be achieved.

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 community of practice. That association includes a reciprocal relationship between the individual and the learner. 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. The ideas in this paper are drawn from a review of the literature and studies of workplace learning. The work here needs to appraised through further empirical study. This work has just commenced.

References


