The Transfer Problem Distinguishing Between Sociocultural and Community of Practice

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The transfer problem: distinguishing between sociocultural and community of practice

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Abstract

This paper examines the problem of knowledge transfer from a sociocultural perspective. It is held that expectations of and understanding about transfer between different types of social practice (e.g. between the classroom and workplace) may be based on incomplete premises. It is proposed that vocational knowledge is sourced from different levels of social practice, each with its own characteristics and potential for transfer. Chiefly, the sociocultural and community of practice levels of social practice are discussed in order to identify the prospects for transfer within disembedded (sociocultural) and embedded (community) levels of social practice, as that is where individuals construct and transfer vocational knowledge. It is proposed that, in current frameworks, curriculum goals for vocational education often relate to the sociocultural level, yet with expectations of and judgements about that knowledge is made at the community of practice level. Moreover, as these circumstances are often quite different, transfer across different kinds of settings and circumstances will likely demand ‘far’ transfer, something which does not readily happen. This may help explain the paucity of transfer from two different communities of practice - the ‘classroom’ and the workplace. The paper concludes with a discussion about approaches to maximising transfer across settings and circumstances which emphasise the need to both embed and disembed knowledge.

Introduction

A sociocultural view of knowledge transfer is developed in this paper which builds on cognitive theory to propose that the prospect of transfer has social and cultural dimensions. Rather than being premised on a view that knowledge is separate from and uninhibited from social practice and, as such, is transferable among different situations and settings, it is proposed that knowledge construction and, hence, transfer is embedded in particular circumstances. Consequently, knowledge embeddedness plays a role in transfer. Therefore, the prospect for knowledge transfer
is not based simply on the object similarity of knowledge (e.g. knowledge of mathematical, cooking, building, nursing) among circumstances, but the way that knowledge is constructed, valued and utilised in different communities of practice. For instance, the transfer of knowledge about mathematics across different settings has been demonstrated to be quite limited (e.g. see, Stigler, Barclay & Aiello 1982; Carraher, Carraher & Schliemann 1985; Ceci & Liker 1986; Scribner 1984; Lave et al. 1984). What is understood about and ability with mathematics in one setting (e.g. school room, construction site, race track) does not necessarily predict the ability to transfer it to another circumstance. In fact, quite the opposite appears to be the case. School students when faced with mathematical problems based in everyday experience abandon their mathematical knowledge (Pea, 1987).

Understanding the basis of transfer is important because whether individuals learn in educational institutions or workplaces there is the need for the knowledge they construct to be transferable to other circumstances. Given the goal of most educational institutions is to provide students access to knowledge which is applicable to target settings, which are usually other than the circumstances where the knowledge is constructed, this understanding is central to how we should consider goals for instruction. In the discussion below, the concept of transfer is initially discussed drawing on cognitive perspectives. These views are then augmented by sociocultural theory which emphasise how the activities individuals engage in influence their structuring of knowledge and, hence, its transfer. It is then proposed that these activities are structured by the activity systems of the communities of practice in which the knowledge construction occurs (e.g. TAFE setting or workplace). To illustrate the nature of the embeddedness of knowledge, the community level of social practice (embedded) is compared to the sociocultural level (disembedded). Next, it is proposed that vocational education curriculum which is centrally developed and framed by key competencies operates at this level. Moreover, the problem of transfer between, say, the TAFE college and the workplace is that the knowledge that is constructed in very different communities of practice not at the sociocultural level. This situation fails to fulfil expectations of the wholesale transfer of knowledge at the sociocultural level. So while there is belief that curriculum is disembedded, and therefore inherently transferable, in fact its enactment necessarily embeds it a particular community of practice (Lave 1990). The degree of difference or similarity between the knowledge constructing activities in particular settings is held to be a determinant as to whether transfer is ‘near’\(^1\) or ‘far’\(^2\), or as appears to be the all-to-

\(^1\) see below
\(^2\) also see below
frequent case, a transfer too far. This is apparently why school students have difficulty undertaking mathematical activities in a diary (Scribner 1984); why abacus counters have difficulty with paper and pencil tests (Stigler, Barclay & Aiello 1982); as do confectionary vendors (Carraher, Carraher & Schliemann 1985) and construction supervisors (Carraher 186). Even expert race-odds totters had difficulty when asked to undertake a different type of calculation that the one used in their practice at racecourses (Ceci & Liker 1986). Finally, the paper then concludes with some speculative comments about how the problem of transfer can best be addressed.

Transfer

The paucity of transfer of the knowledge students construct in educational institutions to applications outside of those settings (e.g. workplaces) has been widely reported (e.g. di Sessa 1982; Lave 1988; Pea, 1987; Raizen 1989;1991; Resnick 1987; Scribner 1984). Concerns about the lack of transfer been used to suggest that workplaces rather than educational institutions should be used to foster the development of knowledge for workplace performance, to overcome the transfer problem. But to what degree is the problem one of a failure of transfer from educational institutions or a more fundamental question about how individuals construct knowledge? A proposition worthy of careful examination is that learning is a product of ongoing participation in everyday activities in the ‘lived in’ world (Lave 1993) and that knowledge is initially embedded in the circumstances of its construction. As such, there is no reason why, on its own, the learning in formal educational settings should be any more transferable than that knowledge constructed in other settings and that transferability is not a direct consequence of learning in those settings. Such a view is counter to popular perceptions and expectations that knowledge secured in educational settings should be inherently transferable (Rogoff & Lave 1984). Rather, to improve transferability across settings, specific guided instruction is likely to be required to disembed knowledge in order to enhance the prospect of its adaptability to other circumstances and settings. Both the cognitive and sociocultural constructivist perspectives provide useful insights in examining the nature of transfer. In particular, sociocultural theory is seen as being able to build upon and augment the understandings of transfer provided in the cognitive literature.

Cognitive psychology furnishes an account of the construction of individuals' representations of knowledge in memory. Representations are held as forms of conceptual and procedural knowledge, referred to as cognitive structures, which are constructed, organised in memory and utilised in addressing both routine and non-routine cognitive activities, such as problem-solving and transfer.
Problem-solving is central to cognitive psychology, being viewed as the process which transforms and extends knowledge, thereby being associated with learning and cognitive development (Anderson 1993). The effective deployment of cognitive structures in non-routine situations (e.g. complex problem-solving and ‘far’ transfer\(^3\)) within a domain of knowledge is associated with high levels of performance or expertise (Anderson 1982; Ericsson & Simon 1984; Glaser 1989; Gott 1989; Wagner & Sternberg 1986) a facility dependent upon how individuals represent the problem and construct ‘problem spaces’ to secure solutions (Chi, Feltovich & Glaser 1981; Glaser 1984). Importantly, the construction of the problem space (the organisation of the parameter of the problem, its possible solution choices and pathways) is underpinned by the adequacy of individuals’ cognitive structures.

So the view within cognitive psychology is that transfer is through problem-solving (both routine - ‘near’ and non-routine - ‘far’). This literature views thinking as a skill (Sternberg 1989), the effectiveness of which is determined internally by the extent and organisation of cognitive structures. Within this discipline, domains of knowledge are viewed as being bodies of knowledge associated with an academic discipline or subject matter, held as long-standing truths (Prawat & Floden 1994). These assumptions may well be fundamental to the transfer problem because they fail to acknowledge that there are different sources of these representations of knowledge, or that these domains are not absolute but are highly situated and likely to exist in different levels of embeddness, or offer a view about the influences of these sources and how this might render transfer more or less likely.

Whereas cognitive psychology is primarily concerned with the internal processes of the mind, the socio-cultural constructivist perspective provides an account of the social genesis and construction of knowledge. This view of cognitive development, emphasises the appropriation of knowledge through interpersonal social interactions (Vygotsky 1987) and more distant social and cultural contexts (Scribner 1985b). Appropriation is the process of constructing knowledge from social and cultural sources, mediated by individuals’ idiosyncratically structured knowledge. Figure 1 depicts the process of knowledge construction or appropriation through problem-solving. This construction contributes to the individual’s ontogenetic development. However, as implicit in what has been proposed above, the process of appropriation involves an interpretative processes which means that the particular stimuli or problem-solving interlude will not be undertaken in a uniform way or have uniform outcomes, because they are premised on individuals’ existing cognitive structures. However, over time and through ongoing social interaction it is held that these structures are likely to become more comparable (Newman, Griffin & Cole 1989).

\(^3\) see below
So, although viewed as problem-solving, appropriation is not the mere internalisation of externally derived stimuli, but instead consists of individuals constructing their own versions of knowledge (Leonteyev 1981). Thus, the appropriation of knowledge is the outcome of an interpretative construction, mediated by individuals' personal histories interacting with socially sourced knowledge, emphasising the mutuality between persons acting and the social and cultural circumstances in which they act (Rogoff 1995) or are co-constructed (Lawrence & Valsiner 1993). Hence, the origins and constraints of knowledge are socially determined which necessarily proposes that the transfer of that knowledge is mediated by interpretative and social factors. Take dialects, for example. As Bourdieu (1991) argues, dialects are a social product that have become an unconscious part of everyday acting and have involved social sources being transformed into determining how the muscles in the mouth are used to enunciate words. Confrey (1991) suggests that the meaning of words is a social product, rather than being objective or singular. These meanings have social sources having particular meaning in different circumstances and settings. In these ways, sociocultural theory holds that engagement in socially-determined goal-directed activity promotes the psychological function of the learner (Brown, Collins & Duguid 1989; Leonteyev 1981; Martin & Scribner 1991; Scribner & Beach 1993). Therefore, everyday activities and the knowledge needed to be learnt, particularly complex knowledge, have social and historical origins, and have evolved over time, through social practice (Bourdieu 1991; Scribner 1985b; Vygotsky 1978; Wertsch 1993).

Cognitive theory partially explains the phenomena outlined above as compilation of procedures or chunking of concepts. As procedural knowledge becomes well-practised, compilation occurs with
movement from declarative (stateable) to autonomous stages of Anderson's (1982) theory of skill acquisition. As compilation comprises the collapsing of specific procedures, it involves compiling responses to particular situations and activities. Equally, as concepts become routinely associated, they become chunked. This development, like compilation is sourced directly from the socially-determined circumstances of the acquisition of knowledge, as the compilation of procedures and chunking of concepts are linked or indexed to activities and goals which are socially determined. Consequently, as specific procedures are responses to particular social circumstances and socially generated goals, compilation of procedures is the automation of responses sourced in a particular set of circumstances (Billett 1996). The significance of the chunking and compilation of knowledge is that it demonstrates associations between particular social sources and cognition. Moreover, chunked concepts and compiled procedures are those that are usually deployed ‘unconsciously’ and will require conscious monitoring and careful (non-chunked or de-compilation) deployment if they are to be transformed. Just consider the habitual practices we use daily which are so hard to change. In typing this paper I am consciously trying to change to placing only a single space after each sentence, having used this practice of placing a double space for some years. Consciously, and with difficulty my compiled procedures are being monitored to make the change. When my conscious thinking is engaged in another task, I am more likely to repeat the compiled mistake.

Common to both routine and non-routine problem situations is the requirement to transfer knowledge from one circumstance to another. Transferring knowledge is the process of recognising similarities between a past situation and a new (problem) situation, and then using cognitive structures to fashion an understanding of the new situation. Prawat (1989, p. 25) views transfer as "the ability to draw on or access intellectual resources in situations where those resources may be relevant". This was elaborated upon earlier by Hoffding (1892 cited in Pea, 1987) who suggests that failure of transfer occur most frequently because the learner fails to recognise the new situation is similar to the one encountered previously. The new situation does not give rise to existing knowledge. A cognitive theory of transfer advanced by Royer (1979) proposes that knowledge representations are used in transfer and that transfer depends on the richness of knowledge structures. Richness is associated with the number of connections or interconnections made through representation and indexing to the circumstances of its application (Royer 1979). A key premise of his theory is that comprehension is necessary for transfer and dependent upon circumstances under which material is experienced. So enriching the conditions of acquisition of transfer may assist maximising indexing and recall. Access to rich indexing reduces the need for a conscious search strategy (Ericsson & Simon 1984). Yet, this might also act as an inhibitor on transfer with indexical factors (e.g. physical environments, tools or
circumstances) are different between source and target settings. This appeared evident in the mathematical studies. The interpretative view is supported by Pea (1987) who argues that “elements perceived by the thinker as being common between the current and previous situation are not given in the nature of things, but are real in terms of thinkers culturally influenced categorisations” (p.639).

Royer classifies transfer as being either ‘near’ or ‘far’, permitting transfer to either similar or novel situations (1979). From this work, it is proposed that transfer and problem-solving are viewed as being similar activities, with ‘far’ and ‘near’ transfer being consonant respectively with routine and non-routine problem solving. Similarly, Voss (1987) holds learning is subordinated to transfer, as knowledge acquisition involves reconciling prior knowledge with new information by interpreting new information against what is already known. For ‘far’ transfer to occur, higher order procedures are required to interpret the situation, for example, recognise, represent or relate to the indexation (Stevenson 1991), thereby abstracting understanding from one situation to apply to another. When considering ‘far transfer’, individuals' capacities to discern familiar, albeit abstracted, elements within the target task depend upon their capacity to conceptualise the problem, and to use domain-specific procedures and higher order procedures to probe, monitor and determine progress. Yet, as Garner (1990), Pea (1987) and Posner (1982) caution, such a task is effortful and unlikely to be undertaken, unless individuals perceive value in expending the effort. Goodnow (1990) makes the observation that individuals not only learn to solve problems, they also learn what problems are worth solving. Therefore, social circumstances also influence the amount of effort expended in the search strategy. So it is more than an individual response, it has its basis in social and cultural factors.

A view of knowledge being sourced and patterned by social circumstances raises questions about the degree to which it is reasonable to expect transfer of knowledge across unlike situations (Perkins & Salomon 1989). Cognitive research can be criticised for not questioning assumptions behind conceptualisations of transfer, despite overwhelming evidence of the paucity of transfer from one situation to another (Lave 1988). For example, as foreshadowed above, the transferability of general mathematical algorithms and heuristics, which might carry expectations of general applicability, have been challenged. Yet, as stated above, studies of professional abacus counters (Stigler, Barcley & Aiello 1982), street vendors (Carraher, Carraher & Schliemann 1985), horse racing handicappers (Ceci & Liker 1986), dairy workers (Scribner 1984) and shoppers (Lave et al. 1984) indicate that, when asked to undertake school-type mathematical calculations, participants performed weakly. Yet these subjects performed complex mathematical calculations with high levels of success in other activities. Consequently, these subjects are not mathematically incompetent; a situation which
questions assumptions about domains of mathematical activity and circumstances in which transfer is more or less likely. Hence, transfer cannot be conceptualised as simply the transfer of disembedded mathematical principles from one situation to another (de Sessa 1982). Rather, the prospect for transfer is likely to be based on the ways in which mathematical activity is interpreted by individuals as being similar to another form of mathematical activity. Compounding the transfer issue is that mathematical contexts are not defined by physical factors or objectives, but how they are perceived by individuals.

From this discussions, it is proposed that the likely degree of transfer depends on the effectiveness of representations. Such effectiveness is not dependent on the application of disembedded principles regardless of circumstance; instead, it depends on situational aids which assist competent performance. Transfer to another similar form of mathematical practice, or use of another counting aid, may render the transfer ‘near’. Either way, transfer is closely linked to social circumstances because, for knowledge to be transferable, individuals need to abstract concepts from one set of circumstances and determine the nature of their applicability in another, as Lave (1993) argues. Significantly, as with routine and non-routine problem-solving, individuals determine whether transfer is ‘near’ or ‘far’. These propositions suggest that to understand further the problem of transfer that a more explicit understanding of social practice is required. In the next section, levels of social practice are articulated and the consequences for transfer are discussed.

**Transfer, activities and levels of social practice**

As stated above, the sociocultural perspective views knowledge construction as being patterned by the social and cultural circumstances in which knowledge is experienced and acquired. Drawing on Vygotsky and his adherents, a set of levels of social practice has been synthesised (Billett 1995). The identification of these levels is required in order to understand further the nature of social practice and how it influences learning and transfer. These levels include the evolving socio-historical source of knowledge (phylogenetic) (Vygotsky 1978), sociocultural practice (Scribner 1985), individuals’ life histories or ontogenies (Vygotsky 1978) and microgenetic development (moment-by-moment knowledge construction through problem solving) (Rogoff 1990). Therefore, representations of knowledge are the patterned consequences of the social mediation of knowledge which has its origins in history, culture and the community in which the problem-solving occurs. These levels are depicted in Figure 2.

**Figure - 2 Levels of social practice** (source Billett 1995)
Key among the social circumstances for accessing and acquiring vocational knowledge, and hence cognitive development, are the socially and culturally derived norms of a community of practice (Lave 1990; Lave & Wenger 1991) where individuals engage in goal-directed activity. A community of practice is defined as a set of relations among persons, activity and world, over time and in relationship with other tangential and overlapping communities of practice (Lave & Wenger 1991, p. 98). The complex of social factors which constitute, maintain and advance the community is conceptualised as an activity system (Engestrom 1993; Leonteyev 1981). The norms and practices of the community which collectively distinguish it are referred to as the culture of practice (Brown, Collins & Duguid 1989). These norms are central to the conduct of, and participation in, vocational activities and also determines what constitutes expertise in these communities. This view of expertise suggests that expertise cannot be accounted for by the application of universal cognitive activities, but rather that situational factors are key determinants in problem-solving - hence transfer from one community (e.g vocational college) to another (e.g workplace) needs to account for the norms, types of problems, problems-solving goals that occur in those communities.

The differences among communities of practice can be understood by referring to their activity systems (Leonteyev 1981, Engestrom 1993). Activity system are the complex of factors which influence the activities and, hence, the culture of practice. An approach for analysing activity systems, has been provided by Engestrom (1993). In advancing three principles to be observed when utilising
activity theory, he complements the arguments of the Vygotskian tradition of a socio-historical
genesis of knowledge. Firstly, a collective activity system can be taken as a unit of analysis, giving
context and meaning to seemingly random individual events. Secondly, the activity system and its
components can be understood historically. Thirdly, inner contradictions of the activity system can be
analysed as the source of disruption, innovation, change and the development of that system,
including its individual participants (1993, p. 65).

**Figure 3**

Influence of the circumstances in the construction of knowledge

So it is activity systems which influence the activities and what needs to be undertaken within
communities of practice. Hence, if engaging in goal-directed activities shapes the cognition of the
problem-solver, the activity system influences the prospects for transfer in different ways as
activity systems influence activity, norms and goals.

**Transfer and levels of social practice**

One view of educational institutions and their goals is that they are in some way ‘decontextualised’ -
that is that the knowledge constructed in these settings is somehow unaffected by the circumstances
of its construction. This view was held by early theorists such as Bartlett 1958 and Bruner 1966 who
advocated the educational goal of promoting orderliness in thinking to promote transfer. Students
were taught chess and Latin to secure logical and disciplined thought. Such a view is reflected in
approaches within instructional environments to remove unnecessary contextual distractions which could counter the development of deep and general thinking processes. Also, early experimental empirical work within cognitive psychology wherein a key task was remove variables which might contaminate the findings. Hence, an empirical basis for inquiry developed which sought to remove distractions, yet in doing so placed these activities within a different set of circumstances than those in which what ever was being investigated would, ultimately, be applied. This might explain why so much of these findings from these investigations failed to transfer to applications in other settings (Newman, Griffin & Cole 1989). That is their findings failed to account for or appreciate the necessity of activities being embedded in social practice. From what has been advocated above, all learning and hence transfer is situated in and influenced by particular circumstances. Moreover, each circumstance is shaped by its activity system and has its own culture of practice. An examination of the factors which comprised activity systems make such propositions understandable.

So, consider the activities that students engage in colleges, universities and schools. To what degree do these activities reflect those activities which are being undertaken in the circumstances where the knowledge is to be applied? Students may well learn many things (they probably have to) which are unique to educational institutions, but may not develop many of the forms of knowledge needed for the target circumstances which are simply unavailable to them in educational institutions. For instance, consider the activities that nurses engage in during their university-based training compared with that in hospital-based training. Regardless of the value placed on either of these settings there is a likely prospect of learning things which are privileged differently in each setting. How will nurses learn about the relations among other professionals and staff in hospitals and how to organise their time on a shift in circumstances where they will not encounter these activities? Equally, to what degree can the ersatz hospital wards now being created in Universities to contextualise nurse education provide the authentic experiences which are likely to develop knowledge which is ‘near’ to that used in hospital wards. Put simply, the two settings comprise different kinds of communities of practice and it is likely that transfer (near) is more likely to occur across two similar sites (e.g two hospital wards) than across two different types of sites (e.g. university teaching area and hospital ward) which makes for ‘far’ transfer. Importantly, this is not to attack educational institutions or their programs but to suggest that knowledge has social and cultural dimensions which will influence the prospect for transfer and that these facts need to be accounted for in curriculum. It cannot be assumed on its own terms that knowledge constructed through participation in educational programs is inherently transferable. Rather, it is the sort of problem-solving undertaken by students and the guidance provided which is likely to determine the prospect for transfer. Below, some discussion on
how transfer might be improved. The transfer problem seems to be that the educational institutions are providing knowledge to students at the socio-cultural level when in reality they are at the community of practice level.

This discussion presses for a reconsideration of the notion of ‘knowledge domains’. As stated earlier, within cognitive theory the term domain can be used to describe a specific field of study, such as biology or economics, where it is conceptualised as an academic discipline (Alexander 1991) or to portray domains of knowledge as being long-standing absolute truths (Prawat & Floden 1994). The problem is whether to view knowledge itself as an epistemological truth - an absolute - or whether knowledge should be seen as the idiosyncratic product of individuals' histories (Alexander, Schallert & Hare 1991). The latter view is more consonant with constructivist views of cognitive development. With the help of levels of social practice depicted in Figure 3, the formal disciplinary view of knowledge (long-standing truths) can be thought of as being the historically-derived sociocultural knowledge identified by Scribner (1985b). However, the evolving social practice may well be different in the circumstances where this knowledge is deployed and influenced by the community’s activity systems. Two reasons are offered why individuals interpretative construction is not reduced to some uniform base of knowledge - the ‘absolute’ truth (Prawat & Floden 1994). Firstly, practice is differentiated across social circumstances resulting in different situations (communities of practice) influencing the construction of knowledge. Expertise within vocational activities is likely to be highly diverse, even when described under a common occupational title. An electrician's knowledge of air-conditioning, for example, is likely to be more highly prized and developed in a humid region than in a more temperate one. Consequently, experience with, and encouragement to learn about, air-conditioning may be given priority in one situation and de-emphasised in another. Secondly, individuals' interpretations of what they experience are likely, initially, to be quite idiosyncratic (Newman, Griffin & Cole 1989). As discussed earlier, even expectations about apparently objective occupational practice are unlikely to be experienced in ways that are the same among individuals. Moreover, vocational practice is often based on deciding among a series of options, and taking into account a range of variables, which are not easily able to be stated within the confines of a formal written discipline (Alexander & Judy 1988).

A domain of knowledge is therefore identifiable by the knowledge required by the circumstances of its application (community of practice) and experienced by individuals rather than by a set of disembedded principles (sociocultural practice). This is not to deny the importance of these long-standing principles which comprise the canonical sociocultural knowledge. So there seems to be a
mismatch between empirical work and everyday practice, which implies that to understand transfer and problem-solving there is the need to move away from disembedded tasks to those which are more embedded in the circumstances of their deployment (Anderson 1993). Therefore, it is held that the view of domains advanced within the cognitive literature needs to be augmented by social and cultural factors. Consequently, a domain can be understood at a number of levels. At the community level it is the individually constructed rule-system (procedures) and related conceptual knowledge (propositions), mediated by social and cultural circumstances of its deployment (community of practice). However, there are also domains of knowledge which exist at the sociocultural level, albeit disembedded from actual practice which yield the canonical vocational knowledge (long-standing truths) which is likely to be common across communities of practice. There is also the more abstracted domain associated with socio-historical development of knowledge - evolving historically-derived knowledge which is associated with general goals associated with vocational practice.

A curriculum issue within vocational education is that curriculum documents (syllabi) are increasingly being prepared in circumstances which are remote from actual practice yet seeks to account for the myriad variations of practice and offer quite specific benchmarks by which performance is to be assessed. This approach, while denying the situated nature of expertise and knowledge construction, provides views about vocations which are, at best, only able to inform in a remote and abstracted way. In a recent study of hairdressers it was clear that the canonical knowledge of hairdressing (which is often the level at which curriculum documents speak) was quite remote from actual practice (Billett 1996). Each hairdressing site and hairdresser’s responses where informed in a general way by such prescriptions, but the versions of actual practice where influenced directly by the activity system undertaken in the particular setting. So while national core curriculum documents and assessment benchmarks contain prescriptions, these prescriptions are often quite remote from practice yet seek to specify that which is marked by difference and provide uniform and specific benchmarks from the very aspect of practice which seem to deny uniformity.

**Conclusion: consideration for practice**

So regardless of what settings individuals learn in, whether the workplace or the ‘classroom’ there is a need to consider how best to improve the potential for transfer. Drawing upon cognitive and sociocultural theory and associated research, the following five ways are advanced to achieve this goal. These are: (i) developing the forms of knowledge which are most likely to facilitate the transfer of knowledge; (ii) providing close guidance in the securing of those forms of knowledge
(iii) enriching the conditions of the construction of knowledge through authentic experiences and to include opening up possibilities for its application in other circumstances; iv) pressing learners to abstract principles from a particular circumstance and apply it elsewhere (disembedding it) and (v) sequence activities to provide access to the circumstances where the knowledge is to be applied.

(i) developing knowledge which aids transfer
Cognitive theory holds that the development of higher orders of procedural knowledge and deep conceptual knowledge, within a domain, underpins the kind of thinking which permits ‘far’ transfer. Inducing transfer is unlikely unless these knowledge structures are available. For instance, the chunking of concepts permits transfer (Sweller, 1989). Although not sufficient for transfer on its own, conceptual knowledge seems important because, far transfer requires the abstraction from the existing and the search for similar conditions in the new circumstance (Royer 1979 p.61). Hence, the development of these forms of knowledge at both the sociocultural and community level will likely permit performance within a particular community of practice and promote the prospects of the transfer of this knowledge across to other communities. It seems unlikely that the canonical level (socio-cultural) of knowledge can be achieved without securing the forms of knowledge which permit performance in a particular community (Billett, 1995). Consequently, a key goal is to develop higher order procedures and deep conceptual knowledge of a vocation (e.g. nursing, hairdressing, carpentry) in a particular situation and in doing so secure long-standing truths of the vocation.

(ii) providing close guidance
In developing these forms of knowledge, the guidance of expert others and peers will be necessary to provide both close and indirect forms of guidance, engage in interactions and monitor the learner’s progress. The effective mediation of peers and expert others, do more than serve as models, they mediate learning, provide structure, highlight task relevance and enhance connections, not only to particular circumstances, but also to others (Pea 1987). The indirect guidance of peers and the physical environment will need to be supplemented by that of experts other and peers who are able to provide access to knowledge is unlikely to be constructed without its access being made available, or support with the development of procedures. Models of guided learning such as those provided by Collins, Brown and Newman, Rogoff, 1995, Brown and Palinscar (1989) are likely to be useful.
(iii) opening up possibilities for knowledge application through authentic experiences
An important role within the instruction and guidance is to emphasise the possibilities and variations in which the knowledge is likely to be applied. Rather than emphasising the one best way, variations should be referred to and activities constructed to consider the prospect of knowledge use. Exploring the parameters of the domains. What is the difference between a carpenters’ need to locate levels on the construction of a new building a new house to one that is being renovated; the roles and duties of nurses in different types of hospitals? So while embedding the learning for a particular circumstance is necessary, emphasis on how that knowledge might be used in other circumstances is also required. So a process of embedding and disembedding knowledge is likely to assist transfer.

iv) pressing learners to abstract principles
Fundamental to views of learning and transfer provided above is that the learner is the meaning maker. Much of cognitive constructivist instructional practice emphasises pressing the learner into playing an active rather role in problem-solving activities, rather than an instructional or didactic approach. Part of this, is to draw out salient principles for practice, so that these are not wholly located in the circumstances of their acquisition. Sometimes this process is referred to as reflection. Glaser (1984) holds that understanding (deeply associated conceptual knowledge) is a product of reflective and critical skills. It is aids the disembedding of knowledge from a particular circumstance to permit transfer.

(v) sequence activities to provide access to application of knowledge
Providing access to authentic activities in those circumstances where the knowledge is to be applied, is likely to assist the development of knowledge at the community of practice level and provide a basis for its abstraction. In a study which compared modes of vocational skills development, the students who had a structured mixture of both instructional environment and the workplace, provided (apprentices) reported the greatest ease of transfer of knowledge between those environments, than did learners who had experienced either only workplace or participation in formal learning settings (Billett 1993). Indirect guidance such as this may take learners into situations where their existing knowledge can be challenged and extended.

These approaches have a common and compounding role, this is of embedding knowledge in particular circumstances and providing the ability for learners to subsequently disembed knowledge and transfer it elsewhere. It has been proposed above that thinking skills alone will
not be sufficient to permit transfer as there needs to be an account of the social and cultural contributions to thinking and acting as similarities and abstracted meaning are not objective and singular, rather they are entrenched in circumstances and situations. Hence, the social and cultural aspects of cognition need to be accounted for in expectations of transfer as does the interpretative process of knowledge construction.

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