Developing vocational skills in the workplace

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Abstract.

Research into learning processes in informal or natural settings should become a priority for higher education in Australia. This paper suggests that learning processes based in the workplace may provide the most likely opportunity for the development of vocational expertise. It is asserted that the utility of research into workplace-learning provisions is premised upon two quite distinct rationales. Firstly, workplace learning provides an opportunity for access to skill development which meets the needs of both employers and employees. Secondly, recent research into sited-cognition and authentic activities, as part of a developing body of research into learning, stresses the value of knowledge derived through social interaction in specific domains as a basis for the development of robust and transferable knowledge - the foundations of expertise. Further research is required to link this work with industry training. The paper concludes by suggesting areas of research that will be needed to be undertaken to effectively explore the potential of the workplace as a learning setting.
INTRODUCTION.
There are two quite distinct but compelling reasons why it is timely to extend research activities to considering the workplace as an appropriate environment for the acquisition of vocational skills. Firstly, there is increased demand for vocational skill development arising from government policies such as award and industry restructuring. Given that the existing vocation training systems are ill-placed to respond to this demand research is required to ascertain how it can be met. Secondly, the value and potency of learning in informal settings, such as the workplace, is being supported by current research and theorising. This research needs to be extended into vocational education and training. The first section of the paper asserts that workplace-based learning processes are well-suited to the current conditions and requirements of skill development within Australian industries. It does this by drawing on the author’s experience within a range of Queensland industries. In the second section the paper outlines some of the research from cognitive science, sociology, ecological psychology and learning anthropology which indicates the potential of learning processes based in natural settings, such as the workplace. Having outlined this research the paper concludes with some recommendations, in the third section, about areas of research which need to be addressed in order to advance an understanding of how natural settings can contribute to the development of vocational expertise and accommodate the requirements of both employers and employees.

INCREASED DEMAND FOR SKILL DEVELOPMENT
The increased demand for industry training in Australia is premised upon new industrial agreements which link the acquisition of skills to movement through career paths and levels of remuneration. This is a product of government policy implemented through tri-partite (government, unions and employer) initiatives for the establishment of skill-based classification and remuneration procedures (Dawkins & Holding 1987). Typically, these initiatives emanate from award or industry restructuring exercises which are currently taking place in a range of industry sectors. However, a series of constraints usually linked to issues of costs and access to skill development are currently inhibiting opportunities for skill development. What is suggested below is that effective skill development processes and
access considerations provide a sound premise for the development of learning processes based in the workplace. These issues are addressed below in terms of industry restructuring, limits of public provision and problems of access to skill development.

Industry restructuring and the demand for training.
The move to link the acquisition of industry-specified skills, to rates of pay and career advancement is part of the restructuring of industrial awards and agreements in a range of industries based on the Structural Efficiency Principles adopted by state and federal industrial relations commissions. This linkage has precipitated an increase in the training demand and it is anticipated that a significant increase in the amount of training will occur in Australia (Deveson Report 1990). Employees need access to relevant skill development programs to acquire the requisite skills for career-pathing and wage increases. In some enterprises or industry sectors this may simply mean the formalisation and recognition of existing informal training. In other situations courses and programs will have to be developed because there is no previous tradition of training or training arrangements in those industries. Associated with the introduction of industry-specified skill acquisition processes are the inevitable questions about training costs and who should pay for the training effort. For skill development processes to be acceptable they need to be responsive to the requirements of both employers and employees.

From the employers' perspective the cost of skill development is the key issue. For skill development processes to be seen to be effective they have to have appearances of providing returns for any investment. From the employees' perspective as the acquisition of skills through development programs brings the potential for increased remuneration and career advancement then access to those programs becomes a key issue. If employers are not convinced about the return for their investment in training their commitment will probably be, at best, one of superficial compliance to award provisions. With such arrangements in place those who are unable to gain access to skill development programs will be structurally disadvantaged. Skill development processes and arrangement which meet the requirements of both sponsors (employers) and learners (employees) are the ones most likely to be
accepted and supported by the industrial parties. Workplace-based learning processes have the potential to partially address issues of access and cost – particularly if they can be conducted as part of everyday workpractice. It appears this has been successfully done in Japanese corporations (Dore & Sako, 1989).

Need to develop and demonstrate competence in the workplace.

Effective performance in the workplace is a key component of demonstrated competence within the industry-led training arrangements outlined above. Many of the skills required for this effective performance cannot be adequately developed and assessed purely within the formal settings such as TAFE colleges or schools. Consequently many vocational courses are now being changed to integrate the off and on-job components of skill development. This integration will certainly be a part of structured entry-level training programs such as apprenticeships, traineeships and the whole gamut of entry-level training proposed in the Carmichael report (1992). This integration requires effective models of learning in the workplace. Associated with this will be requirements for notions of competence to be demonstrated in the workplace. Given the potential implication of the entry-level training programs across the whole range of Australian industry an effective means of developing skills which include assessing competence within the workplace will be required.

Limitations of public provision of vocational education and training.

The increase in the demand for industry training (Deveson 1990) is now beginning to occur in an increasing number of occupations and industries. The existing public provision of vocational training is cast within clear funding limits. Much of this provision is based on skill development programs for existing trade disciplines and associated occupations. It may be quite difficult for industries with an emerging training demand to gain access to the public provision of vocational education as the entrenched interests of those industries and sectors who are currently benefiting will doubtless militate against any encroachment of their
provision. In addition there are limitations to the training systems' ability to practically assist industries when it lacks appropriate expertise and infrastructure. This situation has arisen because the existing and historical provision of formal vocational education has favoured certain industry sectors. Consequently, the TAFE system lacks the infrastructure and expertise to provide adequate training in a range of industries, particularly the process and production areas such as, food processing, pharmaceuticals, bulk handling, secondary processing, mining operations, manufacturing - the very areas that are central to notions of improving the nation's manufacturing and secondary processing capability.

Given the limits of the expertise and infrastructure within the public provision of training it would seem appropriate for the existing expertise and infrastructure within these emerging industries to be used in skill development processes.

**Limits of access - potential for structural disadvantage**

Finally in this section of the paper it is important to restate the need for access to skill development programs. Many workers will not be able to access skill development programs if they are restricted to formal learning settings, such as TAFE colleges. The location, times of operation and potential offerings of formal settings are restrictive. Consequently, sections of the workforce are unable to access the colleges. Women are particularly disadvantaged as they still perform a range of roles outside of work which may inhibit their participation within formal settings. Members of the non-english speaking background community and women make up a large percentage of workers in processing industries which have little or no training provisions and have the potential to be structurally disadvantaged in remuneration and career advancement processes that are linked to the acquisition of skills. The distance factor is of course a key issue in most states, but particularly in Queensland and Western Australia, with many workers being sited considerable distance from the nearest college. Distance modes of training usually preferred as a 'training solutions', for these situations have some major limitations.

Firstly they are usually only able to develop non-skill propositional knowledge, secondly the typical client group of process and production workers are arguably the most ill-placed group
of learners to benefit from these modes of autonomous learning due to a lack of skills associated with success in these modes, a lack of experience and success with such processes. Modes of workplace learning which can be instituted as part of the normal work processes should provide the broadest access and militate any disadvantage caused through a lack of access to formal settings or distance programs.

These then are a range of issues of demand, equity, availability and, access to appropriate expertise and infrastructure which support the notion of utilising workplaces as a base for vocational skills development. The next section of the paper outlines some of the current research which is supporting the utility of contextual contributions to the development of skills.

LEARNING IN NATURAL SETTINGS.

Although the value of learning in natural settings is commonly acknowledged it still remains an underdeveloped area of research and theorising. Its utility is evident in the development of everyday language and social skills which are, amongst other things, prerequisites for learning in formal settings such as schools and TAFE colleges. The major professions, arts and trades have traditionally valued an extended period of guided informal learning in the development of expertise. Yet with the advent and development of an extensive formal system of education, learning has become separated from the settings in which what is to be learnt is applied (Resnick 1987). One outcome of the formalisation of learning has been the characterisation of learning occurring outside of formal settings as being ad hoc, pragmatic and insubstantial (Marsick 1988, Marsick & Watkins 1991).

This characterisation has been assisted because cognitive science, as the major theoretical discipline concerned with learning, has traditionally emphasised the processes of internal mental changes irrespective of contextual influences. However, in recent years there has been increased research interest in the role of social and environmental contributions to learning. This interest can be witnessed in a range of disciplines associated with teaching and learning such as sociology, cognitive anthropology, ecological psychology and cognitive...
A re-examination of context within Cognitive Science.

The current re-examination of informal and contextualised learning processes in cognitive science has a long and established genesis. The Russian psychologist Vygotsky, in the 1930s, emphasised the role that socialisation plays in the learning, arguing that individuals mediate experiences which represent socially structured tasks and tools (Luria 1976). He proposed that knowledge is conceived inter-personally before becoming an intra-personal quality. Whitehead's (1929) distinction between the acquisition of inert concepts and useful robust knowledge denoted a concern about the substitution of authentic experiences and associated knowledge in formal learning settings. These concerns were also reported in Experience and Education by Dewey in 1938.

Recent empirical research conducted within the sociological orientations of cognitive science has led this current resurgence of interest in context as a contributor to learning. Ecological psychologists, such as Barker (1978), assert that settings and learners are inextricably linked; so consequently are settings and learning. Cognitive anthropologists (Lave 1977, Rogoff & Lave 1984, Lave et al 1984, Moore 1986) have also advanced notions of linkages between learning and situation which has contributed to the current review of existing theories of learning. These researchers conceive knowledge as being socially constructed and suggest that existing theories need to be extended to pay sufficient attention to the contributions of social and physical contexts in the learning processes. One product of this concept of learning has been the recognition of the significance of ‘authentic activity & sited cognition’ in the development of effective learning arrangements (Brown, Collins and Duguid, 1989). Authentic activities are quite simply the everyday practices of a particular setting. Natural settings are the places were those activities are normally carried out as distinct from formal learning settings such as schools, colleges, university or even purpose-built training facilities which are quite different from the environments in which the knowledge developed is actually applied. As activities and settings are seen as key elements in the development of skills the authenticity of setting and activity is crucial. Brown and her associates state that effective learning takes place through situated activity using an appropriate physical environment, the
tools it provides and the cooperative construction of knowledge between expert and novice (1989).

Other recent research in cognitive science acknowledges the utility of specific knowledge and include considerations of the sited nature of learning. (Raizen 1989, 1991; Brown, Collins & Duguid 1989) Studies of expert-novice differences have placed a strong emphasis on domain-specific knowledge and procedures, which suggest a utility for specificity rather than generality in initial learning situations. (Chi, Feltovich & Glaser 1981; Glaser 1984; Wagner & Sternberg 1986; Eylon & Lin 1988, Glaser & Bassok 1989) This emphasis on types of knowledge appears in contradistinction to generic processes and precipitates a consideration of how learning settings provide opportunities to acquire the types of knowledge required for expert performance. It has been proposed that experts utilise a variety of clues provided by the environment, the practice and expertise of fellow workers and their own situated knowledge (de Kleer and Brown 1984) in responding to a problem, all which are usually provided richly by natural situations, such as the workplace.

The strength of activities within natural settings is that the novice is able to see both the process and product of the actual tasks they are to become skilled with. They have access to experts, usually a range of experts, also tools are used and standards are stated both explicitly and implicitly. The learning process that usually accompanies this type of setting is the ‘apprenticeship-type’ model of guided instruction in which the novices attempts to approximate the activities of the expert and is provided with feedback on how to achieve increasingly more mature approximations of expert-modelled tasks. The learners are able to conceive what they are doing as part of the totality of task completion and have to address practical problems in realistic settings and conditions.

‘Practical thinking’ developed in natural settings.

The identification of the value of ‘practical thinking’, as contrasted to theoretical thinking, in workplace settings has also provided support for the value of contextual factors in learning and knowledge type. (Scribner 1984, 1985, 1986, Wagner & Sternberg 1986) Work by Rogoff and Lave (1984) on learning processes in traditional settings has challenged the
assumptions upon which the utility of formal learning settings is based. They propose that knowledge acquired through informal settings is as robust and transferable as that acquired in formal settings. What is also being advanced by Rogoff and Lave, and an increasing numbers of researchers, (eg. Rogoff and Gauvain 1984, Gott 1989, Raizen 1989, 1991) is that school-type learning is mainly useful for application in school-like activities, and that learning in other settings, such as the workplace, may be more appropriate to applications for nonschool-like activities.

**Transferability of skills acquired in specific settings.**

Propositions about the specificity of knowledge and learning settings obviously leads to concerns about adaptability and transfer of learning. If it is being argued that specific settings are the most effective learning settings, then the notion of transferability of learning becomes a key issue. It is evident that transfer can and does take place between settings. Royer's (1979) notions of 'far and near transfer' are important elements in understanding in understanding how particular learning settings can produce the types of knowledge which best facilitates 'near and far transfer'.

Associated work on transferability has acknowledged that adaptability and higher order functions are dependent upon a substantial base of procedural knowledge (knowing how) and propositional knowledge (knowing what) (Evans 1991, Stevenson 1991; Glaser 1984, Posner 1982, Royer 1979). One apparent quality of natural and authentic learning settings is their capacity to provide experiences which present opportunities to develop procedural knowledge and higher order thinking. Types of knowledge that are most likely to be developed in theory and practical classes in TAFE college settings have been differentiated (Stevenson and McKavanagh 1991). Instruction in theory classes settings tended to be concerned with the development of propositional knowledge, whilst instruction in the practical settings generated opportunities for procedural and higher order knowledge. Analogous to this are the social and environmental qualities of workplace learning which have been valued by trades and professions alike.

This section has outlined some of the current research and theorising, mainly within cognitive science, which supports the notion of learning within natural settings because of the access
to authentic activities and the assistance of experts. This provides a sound theoretical platform to examine its implications for vocational education and training. The next section proposes a number of areas of research which are will require further attention.

CONSIDERATIONS FOR FURTHER RESEARCH

The emergence of the need for expanded learning options in the development of vocational skills and the emerging potential of learning in natural settings warrants a more directed research effort within vocational education. Some areas for research are suggested below.

A. Improve learning processes in formal settings utilising learning processes occurring in natural setting

The majority of recent developments related to the potency of learning in natural settings within cognitive science have been directed at improving the teaching and learning processes within formal settings. In America this has occurred particularly in compulsory education. What has been learnt from informal learning settings is being used to improve the utility of the formal setting. This is illustrated by the work on cognitive apprenticeships which uses and refines the traditional processes of workplace-based apprenticeship learning to discover how to make the teaching of reading, writing and maths, amongst other things, more effective in formal settings. (Collins, Brown & Newman 1989; Brown, Collins & Duguid 1989)

B. Developing workplaces as appropriate places of learning.

Workplaces have the potential to be rich learning environments. However their purpose is primarily commercial, service or productive. So whereas the learning processes is assumed to be the key priority in the formal learning setting, it may have to be integrated with the ordinary work practices within the organisation, and not be seen as being a major hindrance to productivity and profitability. Models and processes of learning, such as apprenticeships or guided leaning, which the setting and the process will need to be developed and evaluated.
In developing the skills of employees it could be argued that the natural setting is perhaps the best environment for taking the novice through to being an expert. Becoming an expert is not a linear process premised upon a certain amount of experience. The development process must involve the novice in real tasks in natural settings to ensure that problem solving skills developed are able to address real problem solution and not substitute activities.

C. Questioning the usefulness of vocational training programs which do not include extensive experiences in authentic settings.

Many existing programs of vocational skill development do not have comprehensive and structured experience in natural settings. Most pre-vocational programs and labour market programs are based within formal settings and may be dysfunctional. They may raise expectations yet fail to provide adequate authentic activities which will provide for useable and accessible knowledge for success in the workplace. As these types of programs are being increasingly proposed and sponsored by governments, at significant public expenditure, their relevance and utility may require further evaluation against the growing research and theorising which emphasises the contextual contribution to learning.

D. Determining ways in which non-formal settings can be integrated into the administrative requirements of the nation’s training systems.

There are a number of administrative barriers to a broad acceptance of the workplace as a learning setting, concerning what will be taught, how assessment standards will be monitored and maintained, and how will skills be recognised. These administrative issues are, in part, the result of a vocational education system being based around colleges and other formal institutions. Research will need to be undertaken to reconceptualise these administrative processes to exigencies of natural settings.
CONCLUDING COMMENTS.

The evolving body of research and theory which places a key emphasis the physical and social contributions of learning will cause a re-examination of a range of assumptions about learning in formal settings. However, it provides a particularly useful basis for the development of vocational skills. This research has indicated that far from being insubstantial natural or informal approaches to learning appears to provide robust and transferable knowledge, facilitate the development of vocational expertise with its higher order capabilities. Given the current requirement of the Australian context it would seem that learning in natural or informal settings, specifically the workplace, could provide a basis for broad and accessible skill development process. However, much more needs to be learnt about these learning processes and their direct application to vocational education and training. It would seem to be a fruitful area for future research efforts.
REFERENCES


Workplace-based learning - Billett.


