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**TACIT KNOWLEDGE, LEARNING AND EXPERTISE IN DRY STONE
WALLING**

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**A thesis submitted to the University of Huddersfield in partial fulfilment of
the requirements for the degree of Doctor of Education.**

September 2006

Dedication

To Jane and Stephen, who have both, in their own ways, made great efforts to support the production of this work over its lengthy gestation.

Abstract

This is a detailed study of learning in the context of dry stone walling. It examines what happens in the learning situation. The aim of this work was: 'To understand the nature of expertise in dry stone walling, how it is understood by those practising the craft, and how it is transmitted to others'.

The main research questions were, therefore:

- What happens when dry stone wallers are learning their craft?
- How do they acquire expertise in dry stone walling?
- How is this learning communicated?

This process necessitated developing a way of engaging with the practitioners, eliciting descriptive data about what they were doing, and why they were doing it, through interviews (or conversations) with both individuals and groups, whilst they practiced their skill. Twenty three wallers were interviewed as they worked, building walls.

The material obtained was analysed under seven different themes:

- 'Knowing how'
- The use of tacit knowledge or intuition
- 'Flow'
- Constant decision making, reflection and learning from mistakes
- Individual and subjective variations and experiences
- The relevance of emotion
- The use of 'rules of thumb' or maxims.

Learning walling does not fit simply into any of the seven themes. It is contextualised, complex and individual. It demonstrates tacit knowledge and intuition. It involves emotion, sometimes consciously, sometimes not. It involves memory, problem solving, and learning from mistakes, and reflection. Maxims or 'rules of thumb' were a key element in the learning process at all stages. Linear stages of learning were not evidenced. Deep understanding of the practice is evidenced, and the wider learning and teaching implications are explored.

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Chapter 1 Learning Dry Stone Walling: The Context and the Problem

1.1. Introduction

Dry stone walling is part of the physical and emotional landscape of the United Kingdom. Most people in this country will, with a little encouragement, talk of how dry stone walls are attractive, and often will describe the skill of dry stone walling as a 'dying art', harking back to some apparently long-lost 'golden age'. Tourists come from across the world to see the countryside of the Yorkshire Dales, bounded by many miles of walls. 'Coffee-table' books of photographs of this landscape are common. Rainsford-Hannay (1957) says:

Some people do look upon these walls with interest, and even with wonder, but many more do not. The vast majority, though, in the course of their lives, see thousands of miles of such walls, take them as a matter of course, and seldom give them even a passing thought. Yet here we have a native art, unsurpassed elsewhere (p.19).

Herriot and Brabbs (1979) note:

Those wonderful walls, often the only sign of the hand of man, symbolise the very soul of the high Pennines, the endlessly varying of grey against green, carving out ragged squares and oblongs (p.22).

Lowenthal and Prince (1964) emphasise the visual attractiveness of the countryside:

Hedgerows, stone walls, and roads contain vistas, model contours, reinforce contrasts between textures and colours of adjacent fields, and link contrasting landscapes, as in the Yorkshire Dales, where limestone walls, unbroken and continuous from every tram terminus to the last wilderness of bog and cloud carry the eye from grassy valley bottom up to untenanted heath and rocky cliff. Riversides and roadsides are trimmed and grass verged... although it has few strong vertical lines, the English landscape looks both architectural and tidy (p.325).

People who build dry stone walls sometimes work alone, and sometimes in groups. At agricultural shows across the country, it is common to see a dry stone walling competition as part of the activities. A narrative description is found in Griffiths (1999), where he describes his aim for the competition day as:

To build a wall which is straight in cope and batter and which, at the end of the day, does not catch the eye for the wrong reasons (p.51).

This study examines what happens when wallers are learning their craft, how they attempt to acquire expertise, and how they communicate this learning. Formal learning and the acquisition of expertise in this area, contrary to the 'dying art' description, is in fact alive and well and growing (see Appendix 1). Government Policies on changing farming practices support this growth to some extent (Department for Environment, Food and Rural Affairs, 2005).

Walling, like other 'crafts', has not been seen as an activity which demands high levels of intellectual capacity, or high levels of expertise. Writing on crafts tends to stress their traditional nature (Ley, 1995, Seymour, 2001). Wolek (1999) and Gamble (2001) stress the continuing importance of craft apprenticeship as a way of learning. McEachren (2004) suggests that craft work is simple, and that this is part of its attraction:

What draws many people to craftmaking is the long periods of time that can be spent in quiet contemplation while hands are kept performing simple repetitive tasks (p.147).

This view is not borne out by this study.

Crafts, however, have been elevated to the level of an art by some, for example in ceramics, included in many University Arts courses (such as Glasgow and Newcastle) and Goldsworthy (1994, 2000) is an example of an artist taking dry stone walling to this level. Of walling, Rainsford-Hannay (1957) says:

Dry stone dykers, even when only moderately skilled, get much satisfaction with every movement they make. They are dealing with a separate problem with every stone they handle. If we look at a dry stone wall, we can see the countless little problems had to be solved with every stone. In this way the craft is a long way ahead of any other practised out of doors. Stand and watch a skilled man building such a wall. Aimlessly, it would seem, he picks up a stone for the double dyke, but with no hesitation he finds a place for it, a place where it breaks joint, where it finds a firm bed and where it supports its neighbours (p.31).

So perhaps this craft is not as simple as it might appear, and it may be one that demonstrates, in a very vivid way, the complexity of learning.

Learning and expertise do not exist in a vacuum. The idea of the human being able to do a thing well, in a way which is recognised by others (sometimes lay observers or spectators, sometimes peers) necessitates assumptions or prerequisites. For example, winning a running competition may be simply a matter of who is able to run faster than the others, but it may also need a knowledge (and an ability to put that knowledge into practice) of the tactics of running in a group on a track, when to lead and when to follow, and when to overtake.

Learning is a complicated engagement with action, involving previous experience, using conscious and subconscious understanding of that experience.

Actually 'doing something' like dry stone walling involves using and developing that previous knowledge in an activity which is both physical and mental. This is complicated.

Expertise, in its many forms, could be said to be the application of previous learning (both conscious and subconscious), in a particular domain.

Expertise works within many contexts, but for our purposes, two key contexts stand out as relevant to this study.

1.2. The Genetic Context

Firstly, the genetic context – the power of the brain to learn and act; this is not simple. Many attempts have been made to create robots which can work as well as the human brain, none of which have been so far successful. Dreyfus' (1972) studies attempt to explain why (see section 2.3). Pinker (1997, 2002), in his studies of the mind, begins to examine some of the issues; for example, he compares computer software to aspects of brain functioning thus:

Artificial shape recognisers are still no match for the ones in our heads. The artificial ones are designed for pristine, easy-to-recognise worlds, and not the squishy, jumbled real world (1997, p.70).

In the sphere of physical activity, he describes how humans run:

When we run, we take off in bursts of flight. These aerobatics allow us to plant our feet on widely or erratically spaced footholds that would not prop us up at rest, and to squeeze along narrow paths and jump over obstacles. But no-one yet has figured out how we do it (ibid. p.11).

Pinker (1997) attempts to tie down the notion of 'common sense' but concludes:

"The rules of common sense, like the categories of common sense, are

frustratingly hard to set down” (p.14). These dramatic contrasts are not hyperbole. The more we get to grips with this issue, the more the complexity becomes apparent. Thus:

Thinking is computation, but that does not mean that the computer is a good metaphor for the mind... the organisation of our mental modules comes from our genetic programme, but that does not mean that there is a gene for every trait or that learning is less important than we used to think (ibid. p.23).

So, at the genetic level, even with all the recent discoveries on the human genome, there is no simple understanding of behaviour here, no ‘magic solution’ to the complexities of human life. The human mind is a system:

The mind is not a single organ, but a system of organs... The entities now commonly invoked to explain the mind – such as general intelligence, a capacity to form culture, and multipurpose learning strategies - will surely go the way of protoplasm in biology and of earth, fire and water in physics. These entities are so formless, that they must be granted near magical powers. When they are put under the microscope, we discover that the complex texture of the everyday world is supported not by a single substance, but by many layers of elaborate machinery. (ibid. p.27).

So we have layers of complexity, which we are only just beginning to understand at the physical level. Logically, it follows that the mind-system is full of different parts:

The mind has to be built out of specialist parts because it has to solve specialist problems. Each of our modules solves its unsolvable problem by a leap of faith about how the world works, by making assumptions that are indispensable, but indefensible- the only defense [sic] being that the assumptions worked well enough in the world of our ancestors (ibid. p.30).

At the social level, Pinker again points up the complexities of reality:

Contemporary social commentary rests on archaic conceptions of the mind. Victims burst under pressure, boys are conditioned to do this, women are brainwashed to value that, girls are taught to be such-and-such. Where do these explanations come from? From the model of Freud, and of behaviourism. But when we look around us, we sense that these simplistic theories just don't ring true. Our mental life is a noisy parliament of competing factions (ibid. p.58).

In putting together a picture of where brain, mind, and learning might come together, he finds that the boundary is in dispute. This boundary is critically important in understanding our human nature, the idea of consciousness and self-consciousness. We have, therefore, complexity on complexity. Theories of mind and brain are the subject of intense discussion and dispute, and a distinct lack of agreed or unified theory.

Pinker's argument is that genetics play a large part in brain development, but this does not tell the whole story. In his later work (2002) he takes to pieces several common beliefs or myths that still underpin our view of learning and brain development:

The fact that the brain changes when we learn is not, as some have claimed, a radical discovery with profound implications for nature and nurture or human potential... the only question is how learning affects the brain (p.86).

Genomics, neural networks and neural plasticity fit into the picture that has emerged in recent decades of a complex human nature.

In summary, there can be no learning without innate mechanisms to do the learning. Those mechanisms must be powerful enough to account for all the kinds of learning that humans accomplish. 'Learnability' theory tells us there are

always an infinite number of generalisations that a learner can draw from a finite set of inputs. A successful learner must therefore be constrained to draw some conclusions from the input and not from others (*ibid.* p.101).

What relevance does Pinker's work have to this study? Complexity is present very forcefully, and developing our understanding of how the brain works is adding to the sum of human knowledge. The problem is, the more we get to know, the more complex it appears. There is no simple leap from understanding genes and seeing changing brain patterns on a scanner, to knowing how learning works. However, we are in a position where we can now begin to make those links, however tenuous they might be. Mapping the Human Genome and identifying genetic predispositions for various illnesses might be a huge step forward in our knowledge, but the massively complex relationship between genetics and learning is only beginning to emerge. The importance of subconscious elements in learning are emphasised.

Learning or doing dry stone walling is a particular example of a physical and mental activity which must involve these processes. Can we shed light on this by asking the right questions?

The example of 'running' as a physical activity given by Pinker is important because it underlines the complexity, the inherent implicit nature of knowledge, and the 'instinctual nature' of some physical activities.

We have, then, at this point, a model of learning which involves 'doing things' and which involves previous learning. This previous learning has become automatic, intuitive, or 'instinctual'. Further learning involves further practice. Expertise is about putting into practice this 'learned intuition'.

Damasio (2000), in his studies of neurophysiology and consciousness, demonstrates links between brain activity, emotion, and the development of sense of being human through emotion. He comments: "No aspect of the human mind is easy to investigate" (p.4). He then suggests there are two problems – firstly, how the brain inside the human organism engenders the mental patterns or the images of an object, and secondly, the problem of how, in parallel with the first process, the brain also engenders a sense of self in the act of knowing (*ibid.* p.9). These questions, from a neurophysiologist, startlingly echo problems which Polanyi (1958), Polanyi and Prosch (1975), Polanyi, (1983) Dreyfus (1972) and Dreyfus and Dreyfus (1986) addressed earlier, from a philosophical standpoint, in their studies of learning and knowledge. In Damasio's (2000) study we see real developments of new knowledge in different arenas of study beginning to link together to help form a new dynamic picture of how we learn. In another remarkable echo of Polanyi, Damasio states:

The images that constitute knowing and sense of self – the feelings of knowing – do not command center [sic] stage in your mind. They influence mind most powerfully and yet they generally remain to the side; they use discretion (p.128).

Polanyi was making a distinction between 'knowing that' and 'knowing how' from a philosophical standpoint, yet the similarities of description in addressing the problem of consciousness remain.

Damasio (2000) suggests that consciousness is the "unified mental pattern that brings together the object and the self" (p.11). He then attempts to elucidate the problem from a biological perspective. Here again we have an acknowledgement of the complexities of understanding the human brain and learning. He stresses the integrated nature of emotion and consciousness, referring to the 'parallel scientific neglect' over the last century of three strands of study:

- Evolutionary perspective in studies of the brain and mind
- Homeostasis or the automated physiological reactions required to maintain steady internal states in a living organism.
- The notion of organism in cognitive science and neuroscience (*ibid.* p.41)

He then attempts to make links between these things. In describing consciousness as "an internal process but with associated public manifestations" (p.83), he says:

The solution of the method problem posed by the privacy of consciousness relies on a natural human ability, that of theorising constantly about the state of mind of others from observations of behaviours, reports of mental states, and counterchecking of their correspondences, given one's own comparable experiences (ibid. p.83).

This is a clear description of part of the process of learning.

So what is important here? Emotion is integral to consciousness, consciousness leads to discussion between humans to check and countercheck how we stand in relation to others and how we theorise and change our behaviour on the basis of a newly developed theory. How might we internally model, and externally

express our thoughts and feelings? What frames might we use? Clearly there is no one simple or linear answer to this question.

Damasio (2000) theorises about different sorts of consciousness – those of ‘core consciousness’ and ‘extended consciousness’ – core consciousness relating to homeostatic states and current consciousness of state of mind, and extended consciousness being able to relate to both past and future as well as the present. Extended consciousness includes the idea of ‘working memory’, but is greater than this, as it extends over a longer period of time, and depends on holding in mind neural patterns which describe the autobiographical self. The relevance of this work is that it makes links between neuro-anatomy, memories, behaviours, and learning in a very immediate way. He summarises it thus:

When we talk of molding [sic] a person by education and culture, we are referring to the combined contributions (1) of genetically transmitted ‘traits’ and ‘dispositions’ (2) of ‘dispositions’ acquired early in development under the dual influences of genes and environment and (3) of unique personal episodes, lived under the shadow of the former two, sedimented and continuously reclassified in autobiographical memory (ibid. p.223).

Thus, again, links are being made across biology, neuroscience, and philosophy, bringing a more unified view - although an extremely complicated one – of how nature and nurture fit together. The way that we see learning must be influenced by these new, emerging theories.

Rose (1984, 1992, 1997) contributes much to this debate. His earlier work describing the links between genetics, neurobiology, and psychology places the

debate in its political and philosophical context, and powerfully argues the case for 'human freedom':

Our brain, hands and tongues have made us independent of many single major features of the external world. Our biology has made us into creatures who are constantly re-creating our own psychic and material environments, and whose individual lives are the outcomes of an extraordinary multiplicity of causal pathways (1984, p.290).

In his later work (1992) he concludes that learning is a complex business involving many aspects of brain activity and not reducible to a single linear sequence of events. He concludes – in part:

We still haven't got the slightest idea of just how remembering occurs, how a simple clue can evoke the sequential memory of an entire scene (p.381)

These contributors to our thinking about memory, consciousness, and human nature demonstrate that they are all subjects of discussion, debate, and emerging new understanding.

To understand learning properly in this context begins to appear an extremely difficult and complex task, with the need for contributions from many disciplines. Expertise is about 'learnt intuition in action', which involves memory and tacit knowledge, emotion, and an engagement with action.

1.3 The Educational Policy Context

The current national educational policy context is neither simple nor straightforward. A brief view of recent government policy papers gives a flavour: The Five Year Strategy for Children and Learners (DFES, 2004) embraces ideas which (not surprisingly) reflect government policy across the board – "choice"

(p.6), “joined up and seamless services” (*ibid.* p.3), “partnerships” (*ibid.* p. 5), “leadership” (*ibid.* p.9), “raising standards” (*ibid.* p.33), “freedom and independence” (*ibid.* p.35) and “putting customers first” (*ibid.* p.90). All of these are seen as important ways to develop both products and services and can be found embedded in policies relating to all other government policies – for example, Health, Social Care and Trade. Whether they apply well to Education, and particularly to learning, in its real complexity, may be questionable. In ‘Higher Standards, Better Schools for All’ (DFES, 2005) the ‘key challenges’ are also described as:

Individually tailored education, putting parents at the centre of our thinking, empowering schools to respond to local and parental demands (p.5).

This is, again, a market-oriented description of services, with parents as customers. Further examples abound: “a world class education system” (p.7), (presumably by comparing results) “every school a good school” (*ibid.*) (at this level of discourse, this cannot be argued with, although its meaning might be unclear), and “every pupil achieving” (*ibid.*) (no argument with this either), “standards must keep rising” (p.9), and so on. In ‘Further Education: Raising Skills, Improving Life Chances’ (DFES, 2006) we find similar thinking, although attached to a strand of thought that links the education system to economic development of the country. Nothing is necessarily wrong with any of this, and policy statements are bound, in their nature, to be generalist. However, what does this really mean? We are told:

This economic mission does not mean narrow vocationalism...education and training for personal fulfilment, community development and the love of learning all have an important place and will be sustained (pp. 6-7).

However, Government policy appears to try to divide education into several strands that can be viewed, and developed and delivered, separately. In the section on Teaching and Learning in Further Education, the focus is on a:

...system that provides a high quality learning experience for us all, making effective use of new technology (ibid. p.8).

This appears to mean that the government believes that we need a new body to regulate quality, which will publicise performance information, and intervene when necessary to tackle cases where quality is not good enough and inspect to provide objective external evidence on quality and standards. The policy focus on learning is on 'personalisation', by better guidance on choice of course and institution, and:

...having a proper assessment of their needs.... and being supported to develop a range of effective learning styles in order to get the most from their programme, and to take responsibility for managing their own learning (ibid. p.49).

From these policies comes a definition of, and standards for the expert learner. There will be better pastoral support, and more professional development of teachers. Although these aspirations may be apparently helpful, even worthy, we have to ask firstly whether this approach to education is relevant or central to the business of learning, (rather than organising ways of teaching) and then to ask, in what ways have these things to do with the complex business of learning which we alluded to earlier?

Targets and outcomes, as in other systems such as the Health Service, drive the education system. Government measures education by measurable results, by testing knowledge, memory and logic, comparing results and then claiming success, or identifying failure, of individuals or institutions on this basis. 'League Tables' are used to compare examination results and to compare the performance of schools and Colleges. Woodhead (2001) describes the situation thus:

No government will achieve its goals if it lurches from one initiative to another, hoping that the electorate, mesmerised by its hyperactivity and the slickness of its presentational skills, will have forgotten the solution it was offering a few months back (p.1).

Ball (2006) in his studies of education policies relating to schools, describes the "...intellectual trade between government and educational studies..." (p.61) and "a new economy of ideas and a new generation of single-policy advisers" (*ibid.* p.61). He examines, for example, the idea of 'every school a good school' and the Total Quality Management (TQM) approach to quality in education. In his study of Martineau School, he finds that the reality of a good school is indeed complex and even such a 'good school' is not necessarily a paradigm case of a 'quality organisation'. Thus:

The combination of innovations and changes stemming directly from government policies and from Martineau's responses to those policies produces a set of contradictory experiences and responses from teachers. They are invigorated...empowered... exhaustedalienated (ibid. p.112).

We find that putting policy into practice is not a simple, linear, unambiguous task, and the rhetoric does not appear to reflect the complexity of the reality. Brown

(2002) suggests that experience in the USA provides a strong prima facie case for the claim that a wide range of typical school-age children meet or surpass standardised criteria of assessment in the absence of state involvement in – or significant expenditure on – the education process. Brown refers to the complexity of the issue and highlights the discussion about learning that he says is seriously neglected in the highly politicised atmosphere of contemporary educational policy-making:

Many of the educational questions that have been resolved by fiat in recent years have been features of a perennial debate concerning the nature of knowledge, how we acquire it, and the appropriate institutional means of communicating it. The enduring character of this debatereflects the deep complexity of the issues involved and the fact that disagreements about them are, in a real sense, also disagreements about the nature of society and how we should live (p 91)...the ways in which we learn and the status of the knowledge and understanding that we acquire always have been subjects of controversy. These questions are too profound and many-sided to admit of anything like final answers and the consequences of pretending that they do may be dangerous (p.93).

Clearly, then, this field is neither simple nor uncontested.

Galton (1998) suggests that as we advance up the league table of scores, we may well fall behind on the creative thinking and problem solving. He compares our current practice with that of Pacific Rim countries who are:

...transforming their curriculum to encourage greater amounts of co-operative learning...and to the...development of critical thinking (p.20).

Galton *et al* (1999) discover that, despite all this Government activity, the implementation of the National Curriculum has made remarkably little impact on the structure of primary classrooms over 20 years. They also note that public debate around education policy and practice has been bounded by conviction

rather than an “informed debate” (p.xvi). They describe the many research reports which purport to identify ‘school effectiveness’ and significantly, point out that:

Only recently have some of these researchers begun to consider and discuss the processes of learning, surely a central issue in any debate about school improvement (p.25).

Here we have evidence of many policy developments, based on ideas about what is important for the economy, and the importance of measuring and testing. Outcomes must be tested, and testing focuses on those things that can be most easily tested. There are ongoing debates about whether this approach to learning is about deep learning, or about more superficially attractive results.

Government policy about learning demonstrates similar aspects in dry stone walling courses. Further education colleges which run dry stone walling courses operate within the NVQ system, where any higher level study is linked to ‘management’ rather than practice, and success is linked to external standards validated by the Sector Skills Council for the Environmental and Land-based Sector (LANTRA) (2006a). Achieving a certificate in building a dry stone wall can “contribute to the level 1 and 2 thresholds’ of the education of 14 -19 year olds” (LANTRA, 2006b). This way of looking at dry stone walling clearly does not address the complexities of learning.

1.4. The Problem of Describing Learning, and Complexity

What really goes on, and what really happens when people learn? The problem is to work out what is learning, how learning is applied, and what is learning in action – do 'learning outcomes' really indicate learning? Real learning comes by doing; applying already learnt skills. This is very complicated and involves the use of highly charged phrases such as 'experience' and 'knowledge'. The way people apply knowledge is complex and difficult to grasp. There are many answers (or perhaps no one answer) in this field.

We know life is complex. A whole theory of 'chaos and complexity' is developing.

Gleik (1988) suggests:

Where chaos begins, classical science stops... chaos breaks across the lines that separate scientific disciplines (pp.3-5).

Lewin (1993) refers to:

Arcane new worlds of neural networks, spin glasses, genetic algorithms, and chaos theory offering fleeting glances of complexity and ways of understanding it (p.46)... The notion of emergence is the principal message of the science of complexity... emergence of self-organising dynamics... emergence of a creativity in the dynamics of complex systems in nature (p.191).

He identifies a few simple rules by which complex adaptive systems work:

- The source of emergence is the interaction among agents who mutually affect each other
- Small changes can lead to large effects
- Emergence is certain, but there is no certainty as to what it will be

- Greater diversity of agents in a system leads to richer emergent patterns

(*ibid.* pp.202-203).

Although he uses the example of business management to apply these rules, they can be applied to any complex system, be it the weather, the brain, the heart or a flower growing. Sardar and Abrams (2004) describe the well-known story of how Lorenz, in his studies of weather patterns, discovered that:

Two states differing by imperceptible amounts may eventually evolve into two considerably different states. If, then, there is any error whatever in observing the present state – and in any real system such errors seem inevitable – an acceptable prediction of the instantaneous state in the distant future may well be impossible (p.43).

They then point out that the brain is organised by chaos and that the human brain is a complex non linear feedback system. They describe a “chaos model of consciousness” (p.144) where we can never truly predict how people will behave, and state there is no limit on the number of states that this system can reach. This echoes Pinker’s (1997, 2002) studies of the mind, demonstrating a complexity greater than the universe. Raynor (2000), in an “admittedly exploratory study” (p.4), argues that complexity theory can be applied to school management, describing the school as a complex adaptive system, with the head teacher “operating in a zone of bounded instability” (p.iii). Sardar and Abrams (2004) maintain that complex systems, in general, exhibit the property of ‘attractors’ – representations of the states to which the system eventually settles. Chaotic systems, however, exhibit ‘strange attractors’ – which are ways, for example, of describing water in turbulent flow - patterned, but not stable.

Raynor (2000) suggests:

A central feature of complex adaptive systems is the process of self-organisation, the spontaneous emergence of new patterns of organisation and behaviour arising from the interaction of agents (p.64).

Head teachers operate in a zone of bounded instability, between stability and chaos, where systems change in a complex and nonlinear way, but have a constantly changing form of near, but not complete stability. Thus complexity theory can be seen to be relevant to educational matters and can be useful in describing complex situations. Learning is complex, but patterns emerge.

Galton *et al* (1980) studied the complexity of the real world classroom in their influential ORACLE (Observational Research in Classroom Learning Evaluation) studies in Leicester. Individual, group and class interactions were recorded, and distinct patterns of interaction, related to different organisational styles were identified. Forty seven thousand observations were made of 58 teachers, and 84,000 observations of 489 pupils. Later, Galton (1998) noted not only the complexity of the data, but that interpretation of such data can be more complex an activity that one might first assume (p.7). Galton *et al*'s later work (1999) again stresses both the complexity of the teaching situation and the difficulty of analysing this complexity.

Much has been made of the distinction between 'surface learning' and 'deep learning'. The origins of the idea of 'deep learning' can be traced back to Marton and Saljo's (1976a, 1976b) papers which attempted to establish two different approaches to learning. Leung and Kember (2003) describe the 'deep learning' students attempting to understand the underlying meaning intended by the

author of a passage of writing, and the 'surface approach' students who did not attempt to find 'underlying meaning'.

Biggs (1987) provides a summary of the characteristics of deep and surface approaches to learning: a student who adopts the deep approach is interested and derives enjoyment from the task, searches for the inherent meaning in the task, personalises the task, integrates parts into a whole, and tries to theorise about the task, whereas someone adopting a surface approach see the task as a demand to be met, see aspects of the task as discrete and unrelated, worries about the time taken, avoids personal or other meanings and relies on memorisation to reproduce surface aspects of the task. Although these distinctions have been criticised by Webb (1997), even he concedes that:

The simplicity, universality and power of the deep/surface metaphor, (has) made the message appealing, acceptable, practical and generalisable (p183).

Snow (1989) suggests that the desired end state of learning is that learners are equipped to display articulated, deep understanding of a domain, to possess the ability to reason and explain aspects of that domain in causal terms and to adopt multiple viewpoints about a phenomenon, which means the learner must be 'self-regulating'. Evans *et al* (2003) develop this theory.

These metaphors of learning are important because they have real meaning for both students and teachers. They add to the picture of real learning as complex, and implicit. There are no simple observable mechanisms which can be used to measure learning or outcomes. This underlines the difference of deep learning

from surface learning. Deep learning in dry stone walling is a complex process of learnt 'intuition', involving emotion.

1.5 Complexity, Frames of Learning and Axioms

The view that there is an importance to the way you look at something, and that there is more than one way of looking at something, has developed significantly over recent years. Raynor (2000) suggests that there are:

A range of theories suggest that perception is based on schemas, cognitive maps and paradigms which contain scripts for dealing with particular events, or allow the processing of incomplete or ambiguous information (p.296).

Pinker (1997) explores ideas about 'frames of reference'. Starting from "...how we see the world through our eyes...", he describes the '2 ½ D sketch' which is "specified in a retinal frame of reference" (p.261) and points out the need to link this to other frames of reference in the real world, such as gravity, to make sense of it.

In his work on intelligence testing, Hudson (1966) suggested that (psychological) testing is in an extremely primitive condition. He suggests:

Man's capacity for intelligent thought is one of nature's most astonishing phenomena – (yet)...we find mental testing is a conservative branch of educational technology (p.4).

He describes the two 'paradigms' that emerged from his studies: that of the scientist and the artist (the 'converger' and the 'diverger') and that the success of both of these does not relate to IQ test results:

There is now a solid body of evidence which indicates that the belief that 'the higher the IQ the better' is false (p.30).

The 'converger' is substantially better at the intelligence test than the open ended tests. The 'diverger' is the reverse. Most arts specialists were weak at the IQ tests, but were much better at the open-ended ones. Most scientists were the reverse. Hudson (1996) suggests that much 'creativity' research has been impoverished by a disregard for the complexity of original thought and that aptitude testing has suffered from rigidity and unimaginativeness. He said that:

Now that the empirical connection between the two fields is established, both seem to have suffered from over-simplification (p.51). The gulf between our simple models and the complexity of intelligent people's behaviour is so wide that we are prone to fall for over-simplification as the only alternative to despair (p.115).

Thus we see demonstrated a connection between complexity and different frames of reference. In a later work (1968), Hudson attempted to develop a fuller, more rounded picture of the human and to:

...construct a framework of explanation that leaves one free to draw on both psychological and social forms of information ... (to) lay the way open for a study of the human intellect in which the qualities of the individual and those of academic institutions are seen to interlock (p.3).

He suggested that:

There is every reason to believe that the human personality is organised in terms not of a single polarity, but many...there is no reason why human nature should be organised in ways which are statistically convenient (ibid. p.29).

These insights formed the basis for Gardner's (1993) work on intelligence. In his work on 'multiple intelligences', Gardner reframed the way we have thought about and described intelligence. Here again, we are presented with a model

which is non-linear, complex and emergent. Smith (2002) notes that this work has had a profound effect on thinking and practice in education, especially in the United States. Gardner's work has its basis in several different criteria, one being related to brain activity, others in psychology. Gardner (1993) himself said that making judgements about what was or was not intelligence was reminiscent more of an artistic judgement than a scientific assessment (p.60).

Critics of his work suggest that the evidence for his ideas is not yet properly developed. However, it has stimulated much discussion in the educational world, partly because the theory validates educators' everyday experience (Kornhaber, 2001). Whether the whole theory will stand the test of time and be a useful analytic tool remains to be seen.

Emotional intelligence, first described in 1990 (Mayer and Cobb, 2000), provides another frame through which intelligence might be viewed. Goleman (1995), in his popular study, suggests that emotional intelligence was:

As powerful, and at times more powerful, than IQ in predicting success in life (p.34).

Scherer (1997) went further:

Emotional intelligence, more than I.Q., is the most reliable predictor of success in life and in school (p.5).

Whether this is true, or even helpful, remains to be seen. Goleman's conceptualisation of emotional intelligence consisted of four classes of abilities: perception of emotion, integrating emotion, understanding emotion and

managing emotion. The point here is not whether this particular theory is relevant or evidenced, but that 'there is more than one way to do something': there are many ways of framing problems and issues. In addition, Goleman's descriptions, particularly those of 'flow' do have some immediate connection with descriptions of 'deep learning', as they reflect the nature of involvement and the relevance of emotion to learning.

1.6 Summary

This study poses three main questions:

- What happens when dry stone wallers are learning their craft?
- How do they acquire expertise in dry stone walling?
- How is this learning communicated?

As suggested at the beginning of this Chapter, most common representations of dry stone wallers are romanticised and simplistic. Walling, as other 'crafts', is perceived as an activity which does not demand high levels of intellectual ability or high levels of expertise. Crafts are associated with 'simple repetitive tasks' (McEachren, 2004).

This study will suggest that the reality is different. Perhaps this 'craft' is not as simple as it might appear. An observation of an expert in action, however, might make it appear deceptively so, as he almost subconsciously selects the right stone and places it in the right position (Rainsford-Hannay, 1957). Attempts to define 'expertise' lead to the very core of learning theory. Learning is complicated, involving previous experience, and the conscious and sub-

conscious understanding of that experience. The inherent implicit nature of knowledge and the 'instinctual' nature of physical activities such as dry stone walling need to be understood.

What is emerging at this point in the study is a model of learning that involves 'doing things' and which involves previous learning. As a learner becomes more skilled, this previous learning becomes automatic, intuitive or 'instinctual'. Further learning involves further practice. Expertise involves memory, tacit knowledge and emotion – it is about 'learned intuition' being put into action. Evans *et al* (2003) suggest experts possess a deep understanding of a domain, the ability to reason and explain aspects of that domain in causal terms, and are able to adopt multiple viewpoints about a phenomenon, which means the learner must be 'self-regulating'.

Developing expertise in dry stone walling involves using and developing this previous knowledge, in an activity which is physical, mental and emotional. Wallers learn best with each other and by reflecting on their own and others' practice, become 'experts'. Snow (2001) says:

When I start building, I don't set out to make a beautiful wall. My intention is a lasting structure. Throughout the day, I apply my efforts to the basic principles of dry stone construction. If I follow them successfully, I'm likely to leave behind a pretty good-looking wall (p.29).

Polanyi (1958) described maxims as rules of art which serve as a guide only if they can be integrated into the practical knowledge of the art. They have the potential to demonstrate how learning really takes place. Schön (1987) suggests

that these verbalisations are an expression of learning in action, the application of learning, literally, in practice.

There are some versions of 'principles' or 'lists of things to remember' about building a wall that are already in existence (see Appendix 3 for several examples). However, as this study shows, these are used in different ways at different times. They can sometimes be helpful, sometimes they are not. When these are used, when not, varies with each individual situation. The list of things to remember is not the important part of building a wall; it is *how* it is done that gets the result.

This study uses a particular frame of learning in the skill of dry stone walling. Wallers are encouraged, through discussion whilst actually building a wall, to verbalising their learning through a series of axioms, or 'maxims' or 'rules of thumb'. The next chapter explores in more depth the literature relating to the acquisition of expertise and from this, attempts to develop a theoretical framework to underpin this study.

Chapter 2 Literature Review

2.1 Introduction

This chapter introduces, and then reviews, the literature on a wide range of concepts, theories and ideas behind 'expertise' and its acquisition, and relates it to dry stone walling, particularly noting the contribution of the idea of 'tacit knowledge'. Starting with the major works of Polanyi, then Dreyfus and the development and application of his work by Benner, it then goes on to describe other relevant theoretical contributions by Schön, Pinker and Gardner. This is followed by a discussion of some empirical areas of work on expertise as exemplars – those of sport, music, medicine, psychology and education. The section is concluded with reference to the recent writings on expertise in the arena of dry stone walling and of 'craft'.

2.2 Polanyi and Tacit Knowledge

Levinson (1975) suggests that Michael Polanyi's (1958) and Polanyi and Prosch's (1975) often-quoted critique of supposedly 'objective' science and his theory of personal learning and 'tacit knowledge' is important because it links science with the arts and humanities, and therefore allows us to understand the complexities of 'meaning'. Polanyi's ideas are constantly referred to in such varied fields as nursing and organisational development. Jacobs (2000) describes Polanyi's magnum opus, 'Personal Knowledge', as one of the truly impressive studies of science this century. Polanyi's clarity about the distinction

between 'knowing what' and 'knowing how' resonate well with many approaches to skill development, including that of dry stone walling. Jha (1998) has described his work as in part an alternative epistemology of knowledge to the usual 'scientific' view, which he regarded as 'personal knowledge', a fusion of objective knowledge and of the knower's act of knowing. Polanyi was a Professor of Physical Chemistry and Social Studies at the University of Manchester. His major works (1958, 1983; Polanyi and Prosch, 1975) explore ways of understanding the world vis-à-vis 'science'.

In Polanyi's (1975) work, he states his view of the inadequacy of modern approaches to thought and science:

Our academic wisdom has lain... in never meaning what we said (original emphasis). Our mechanistic methods have divorced our academic pursuits from moral issues and have made them merely academic. (p.22) In general, our morally neutral account of all human affairs has caused us to regard all moral professions as mere deceptions, or at best, as self-deceptions (p.23).

Polanyi bases his argument in the current practice of scientists. He develops his case further when he states that:

No science can predict observed facts except by relying with confidence upon an art: the art of establishing by the trained delicacy of eye, ear, and touch, a correspondence between the explicit predictions of science and the actual experience of our senses to which these predictions shall apply (ibid. p.31).

Polanyi establishes the importance of the person and personal involvement in science. He then uses an example of a hammer hitting a nail to emphasise the

detail of his argument, and the development of the idea of different sorts of knowledge indwelling in our activities: He states that:

*A striking feature of knowing a skill is the presence of two different types of awareness of the things we are skilfully handling. When I use a hammer to drive in a nail, I attend to both, but quite differently. I watch the effects of my strokes on the nail as I wield the hammer. I do not feel that its handle has struck my palm, but that its head has struck the nail. I am highly alert to the feelings in my palm and fingers holding the hammer. They guide my handling of it effectively, and the degree of attention that I give to the nail is given to these feelings to the same extent, but in a different way. The differences may be stated by saying that these feelings are not watched in themselves but that I watch something else by keeping aware of them. I know the feelings in the palm of my hand by relying on them for attending to the hammer hitting the nail. I may say that I have a **subsidiary awareness** of the feelings in my hand which is merged into my **focal awareness** of driving in the nail (ibid, p.33, author's emphases).*

So there are suggested different perceptions and awarenesses and types of knowing, linked together by actions. According to Polanyi and Prosch (1975), perception is the start of a process:

Perception ... constitutes an observation of external facts without recourse to formal argument and even without any explicit statement of the result (p.34).

which is then developed by purposive action:

All sensation is assisted by some (however slight) skilful performance, the motions of which are performed with our attention focussed on the intended action so that our awareness of the motions is subsidiary to the performance (ibid. p.36).

Thus arises the idea of 'we know more than we can tell'. Thorpe (2001) describes it as:

The aim of a skilful performance is achieved by the observance of a set of rules which are not known to the person following them (p.24).

If we focus on outcomes, how we involve ourselves in the 'doing' becomes peripheral. If we focus on the 'doing' we sometimes stumble, and do not perform

as well as we might. Polanyi's example of hitting a nail with a hammer might strike us as particularly relevant to dry stone walling: what can dry stone wallers tell us about tacit knowledge and expertise?

Polanyi (1958) also focused on the idea of 'tradition' in acquiring knowledge:

An art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists. It can only be passed on by example from master to apprentice. To learn by example is to submit to authority. You follow your master because you trust his manner of doing things even when you cannot analyse and account in detail for its effectiveness. By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those that are not explicitly known to the master himself. These hidden rules can be assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another (p.53).

Here we see Polanyi describing what he called 'doing real science', and making links between science and art. Polanyi expands on his concept of 'hidden rules' by referring to 'maxims'; according to him:

Maxims are rules, the correct application of which is part of the art which they govern. The true maxims of golf or of poetry increase our insight and may even give valuable guidance to golfers and poets; but these maxims would instantly condemn themselves to absurdity if they tried to replace the golfer's skill or the poet's art. Maxims cannot be understood, still less applied, by those not already possessing a good practical knowledge of the art (ibid. p.31).

Here we have a description of rules which are domain-specific, can only be used by those who have knowledge, and can only be understood in context. Can we find this in dry stone walling? Polanyi's example of the hammer hitting a nail may be a fortuitous occurrence for this study. The similarity in the physical aspects of

practice is obvious. Can the complexities of tacit knowledge and different sorts of awareness be found in learning dry stone walling?

For Polanyi and Prosch (1975), knowing consists of being involved in doing, and (academic) knowledge follows this path also:

Consider any practical skill. It consists in the capacity for carrying out a great number of particular movements with a view to achieving a comprehensive result. The same applies to skilful knowledge. ..the two kinds of skilful knowing are actually always interwoven: a skilful handling of things must rely on our understanding them; and on the other hand intellectual comprehension can be achieved only by the skilful scrutiny of a situation (p.37).

Can this be found in dry stone wallers' practice?

Although Polanyi's work related to science, he used practical examples to illustrate his point:

We cannot learn to keep our balance on a bicycle by trying to follow the explicit rule that, to compensate for an imbalance, we must force our bicycle into a curve – away from the direction of the imbalance- whose radius is proportional to the square of the bicycle's velocity over the angle of imbalance. Such knowledge is totally ineffectual unless it is known tacitly, that is, unless it is known subsidiarily – unless it is simply dwelt in (ibid. p.41).

Knowing in this sense is innate or 'indwelling'. It can apply to something like riding a bicycle. Polanyi's arguments focus on the essentiality of personal involvement and personal actions in scientific endeavours. Understanding our part in the process is fundamental. He develops the concept of 'tacit knowledge:

There are three centres of tacit knowledge – first, the subsidiary particulars; second, the focal target; and third, the knower who links the first to the second - The knower integrates the subsidiarities to a focal target (ibid. p.38).

Therefore:

*There are two kinds of awareness that are mutually exclusive, a from-awareness, and a focal awareness. We can be theoretically aware of all subsidiaries to a focal awareness, but by focussing on these, they become **deprived of the meaning** (original emphasis) it had when serving as a subsidiary). Thus subsidiaries are essentially unspecifiable (ibid. p.39).*

Here we return to 'we know more than we can tell' – i.e. by taking apart our observations they change their original meanings. We always know more than we can tell, by Polanyi's definition. Others, however, in adapting his ideas, have changed their meaning:- some current studies on tacit knowledge in organisational management, for example, Leonard and Sensiper (1998) explicitly suggest that it is a 'thing' with 'value that can be traded' and have developed the idea of 'group or organisational tacit knowledge'.

Polanyi has his critics: these are extensively surveyed, for example, by Jha (1995), who concludes that:

If we evaluate Polanyi by his own criteria, that is presenting an alternative ideal of knowing based on the way scientific knowing is in fact practised, we may admit he succeeded, provided his alternative ideal is interpreted in an accessible form (p.6).

This underlines the current relevance of Polanyi's work.

Eraut (2000), in a study of non-formal learning, attempts to clarify the use of some of Polanyi's concepts: he identifies several different types of situation where tacit knowledge may be either acquired or used or take place simultaneously. He gives four practical reasons for trying to make tacit knowledge explicit:

- to improve the quality of a person's or team's performance
- to help communicate knowledge to another person
- to keep one's actions under critical control by linking aspects of performance with more and less desirable outcomes
- to construct artefacts that can assist decision making or reasoning (p.134).

He uses the example of a sports coach to illustrate these:

The expertise of the coach lies as much in the selection of the material for closer examination and comment as in the comment itself (ibid. p.134).

He then points out that:

It is clearly worthwhile to pursue the problem of eliciting tacit or near-tacit knowledge. Nevertheless researchers need to be both inventive and modest in their aspirations (ibid. p.135).

It is necessary be explicit, not only for improving performance but also for the purpose of accountability. Some linkage between actions and outcomes is necessary if one is to take responsibility for ones actions. But:

The limitations to making tacit knowledge explicit are formidable, and much of the discussion about it in the literature is ill-informed if not naïve (ibid. p.135).

Eraut's study is interesting because he deals directly with practical examples of tacit knowledge. He suggests that in making tacit knowledge explicit:

The probability is that 'thick' tacit versions will co-exist alongside 'thin' explicit versions. The thick version will be used in professional practice, the thin version for justification, for explaining transfer possibilities, for training purposes, and in evaluative research (ibid. p.135).

Jacobs (2000), in a wide ranging description of the place of Polanyi in the teaching of science, emphasises the importance of Polanyi's work, and stresses the importance of this work for the contemporary education of scientists, describing it as: "...presaging and probably catalyzing themes in thinkers as diverse as Popper, Kuhn, Feyerband, Ravertz and Knorr-Cetina" (p.310). In describing the work of Polanyi and its relevance to science education, Jacobs (2000) describes a remarkably similar structure of 'learning in stages' to that of Dreyfus thus:

*Science education is a cultural **apprenticeship** of novices and students to a community dedicated to cultivating and transmitting a tradition according to particular standards and in the light of recognised values [original emphasis] (p.312).*

The early or 'novice' or 'searching for the rules' stage of learning is described as:

*The student laboriously mastering the mathematical sciences, acquires art-with-content in the course of solving concrete textbook problems. Such problems resemble crossword puzzles in having pre-existing solutions and clues to assist discovery. Attention focussed on the '**unknown**' or the '**conclusion**', the student is subsidiarily aware of the data by which the solution is determined, data being looked at '**not in themselves, rather as clues to the unknown; as pointers to it and parts of it**' (original emphasis) (*ibid.* p.313).*

At the next, or intermediate stage of learning, students solve problems more routinely:

*Then the solution is confidently found and the student has '**intellectual power**' over a type of puzzlement, able to resolve it in a routine way. This is irreversibly '**heuristic**' progress: you cannot learn to solve problems by mechanically following rules; a logical gap has to be crossed to which rules, as '**vague maxims**' whose satisfactory interpretation depends '**on the very art to which they apply**' give only limited assistance (*ibid.* p.314).*

Finally, at a higher stage of learning:

The student proceeding to the postgraduate stage undergoes a qualitatively different training from that which he/she has lately completed. The most important knowledge for acquisition now is The 'art of scientific research' (original emphasis), craft skills for discovering new knowledge, an intensely personal form of knowing how to think and act. Being tacit, the knowledge...defies detailed specification. In the main it exists in skilful practice of highly trained and long experienced researchers, from which it follows that research is an art that can only be learnt by example, the apprentice working in close contact with , and investing implicit faith in the authority of, a true craftsman and 'his manner of doing things'. So it is that the 'rules of the art', many of them not even 'explicitly known to the master himself' are unconsciously assimilated (ibid. p.314).

Here we find a description within the arena of science education of stages of learning, from the novice to the higher levels of expertise. Like other skilful practitioners, the scientist sets 'standards to himself' and judges himself by them (*ibid.* p.317). Do these stages apply in places other than in science education?

Are many of the rules of the art really not known explicitly to the master himself?

Thorpe (2001) underlines Polanyi's relevance for current social theory. He suggests that Polanyi has been criticised for moving from a criticism of sufficiency for knowing rules for engaging in practices, to then positing another set of rules which are then somehow followed without being known. However, this criticism is not valid because, as Polanyi (1958) states:

Rules of the art can be useful, but they do not determine the practice of the art; they are maxims, which serve as a guide to an art only if they are integrated into the practical knowledge of the art. They cannot replace this knowledge (p.50).

Thorpe (2001) points out that Polanyi here implies that "no rules, conscious or unconscious, are sufficient to learn an activity" (p.24). He concludes that

Polanyi's portrayal of personal knowledge and the role of commitment in science provides a powerful insight into the nature of scientific enquiry, and:

Also provides a path through which to recapture and understand Weber's meaning of 'inner devotion to Science' (ibid. p.35).

Thorpe here is referring to the importance of Polanyi's concept of 'passion' in learning. He states that Polanyi:

*Conceives indwelling to entail **passionate** commitment to impersonal ideals, which both transcend and consume the individual (ibid. p.25, original emphasis).*

The importance of Polanyi's work is recognised in many diverse fields such as economics (Dolfsma, 2001), management (Bordum, 2002) and economic geography (Gertler, 2003).

What does this mean for understanding tacit knowledge in the process of learning? This range of studies and applications of Polanyi's work firstly underscores how important the concept of tacit knowledge is in understanding the world and in how people learn.

Ideas about tacit knowledge are manifest in several contexts. According to Gertler (2003), the *social context* of tacit knowledge has never been properly acknowledged. Attempts to understand tacit knowledge as something owned by companies, to be bought and sold, have developed, but need much further work if they are to be useful. Whether tacit knowledge in groups, rather than individuals, can be identified and used is still in question. There are links to be made between the work of Polanyi (1958) and that of Dreyfus (1972), in dry

stone walling: tacit knowledge and implicit learning are part of deep learning. Expertise, at whatever level, is about 'learnt intuition in action'. Studying learning in dry stone walling may be able to illustrate this.

2.3 Dreyfus and Benner on the Acquisition of Expertise

The influential works of Dreyfus (1972, 1992), and Dreyfus and Dreyfus (1986) underpin many of our current ideas about expertise and its acquisition. Hubert Dreyfus' most well-known philosophical works relate to whether artificial intelligence is possible. These works powerfully argue that the essential qualities of humans and the way they learn things are not reproducible to computer operations, and cannot be captured in this way. Selinger and Crease (2002) summarise Dreyfus' view:

A first key element is his rejection of the common tendency to define experts as sources of information. Expert skills are principally a matter of practical reasoning, of 'knowing how' rather than 'knowing that'. 'Knowing that' is propositional knowledge of and about things, obtainable through reflection and conscious appreciation. 'Knowing how', such as the ability to walk, talk, and drive, involves practical knowledge that is mostly experienced as a 'thoughtless mastery of the everyday', and does not require conscious deliberation for successful execution (p.250).

Hubert Dreyfus (1992) lays out the ground for his ideas on expertise, using the example of a person learning to play chess; at some point:

One reaches the level where one sees immediately what must be done. A chess grandmaster, for example, not only sees the issues in a (chess) position, but the right response just pops into his or her head. There is no reason to suppose that the beginner's features and rules or any other features and rules play any role in such expert performance (p xii).

The author introduces the idea of expertise as firstly linked to experience or practice over a period of time, secondly linked to the final stage of several stages of skill acquisition and thirdly including the idea of intuition or use of tacit knowledge. The expert is a very different creature from the novice, thinking and behaving in completely different ways. Stuart Dreyfus posited several stages in human skill acquisition: usually, he said, skill acquisition begins with a novice student learning and applying rules for manipulating context-free elements. After the student begins to understand the area of study or domain, however, he begins to see meaningful aspects, not context-free features. This is known as the 'advanced beginner' stage. At the next stage, known as 'competence', the performer learns to set goals and see the current situation in terms of what is relevant to achieving those goals. After a great deal of experience, a chess player is able to see a situation as having a certain significance tending toward a certain outcome, and certain aspects of the situation stand out as salient in relation to that end. This is called the 'advanced practitioner level'. Only after going through these stages does one become an expert (Dreyfus, 1992, p.xii). Can we see these stages in dry stone walling?

Hubert Dreyfus (2002a) expands his ideas of stages of development using examples of driving a car and playing chess: The novice car driver looks for – and is given – “context free features and rules: seeing the speed from the speedometer and following the rule ‘change gear at ten miles an hour” (p.368). The novice chess player learns a numerical value for each chess piece and the rule “always exchange pieces if the gain will be greater than the loss” (*ibid*).

The advanced beginner driver begins to notice particular aspects of the situation, in context, such as engine noise, to supplement the original rule. He learns the 'maxim' or situational rule to "change gear up when the engine sounds as if it is racing and change gear down when the engine is sounding as if it is straining" (*ibid.* p.369). The advanced beginner chess player begins to recognise some positions as overextended or weak, and can then follow maxims like "attack a weakened king's side" (*ibid.*)

With more experience, a competent performer finds it necessary to work out which parts of the situation are important, and to plan based on these elements, as the number of potentially relevant elements in any situation may become overwhelming. It is not possible to list all the potential actions possible in any situation. Trying to do this is exhausting. Decisions now need to be made by the performer, "who may become frightened rather than exhausted, as he now has to take responsibility for his own actions" (*ibid.* p.370).

Is this really how learning works? Does learning really happen in clearly demarked stages? It may be that implicit learning, constantly practised, may be demonstrable as expertise. Studying learning and expertise in dry stone walling may offer some insights into this.

Dreyfus' description of the emotional parts of learning is interesting because he acknowledges its relevance. Can we find evidence of this sort of process in the practice of learning? Dreyfus (2002a) suggests the affirmative:

Depending on the outcome of his actions, as successful or unsuccessful, the learner finds himself on an emotional rollercoaster. A driver going round a corner may decide he is going too fast. He has to decide whether to lift his foot off the accelerator, or do that and use the brakes. He is relieved if he gets through the corner successfully, and shaken if he skids. The competent chess player decides that his opponent's position is weak on one side, and decides to attack. As the participant becomes more involved in the task in hand, the less easy it is to adopt the detached rule-following stance of the beginner (p.370).

Dreyfus is clear that this is constructive:

While it would seem that this involvement would interfere with detached rule-testing, and so would inhibit further skill development, the opposite seems to be the case (ibid.).

As the learner practises, rules and principles become gradually replaced by situational discriminations, associated with associated responses. For the proficient practitioner, plans are intuitively evoked and certain aspects of plans stand out as important. The learner sees what needs to be achieved rather than deciding what needs to be achieved. However, the performer must still decide what to do. There are many more ways to respond to a situation than there are ways of seeing what is going on, and the proficient performer must still fall back on 'detached rule following' to decide what to do. The proficient driver perceives he is going too fast round a corner – he does not have to add up the elements of speed, road condition and tightness of the corner, but he still needs to decide how much he needs to slow down, and how to do that. The proficient chess player can recognise many types of board positions. He must still decide which move to make.

However, according to Dreyfus (2002a), when we get to the expert stage:

The expert not only sees what needs to be achieved, with his repertoire of experience, he sees what needs to be done, and does it. What must be done, simply is done. The expert chess player can play at the rate of 5 to 10 seconds a move or faster, and at this speed, they must rely almost entirely on intuition rather than analysis (p.372).

Not being able to easily demonstrate subconscious processes, we now have 'intuition' instead. These processes are indeed complex. It is possible that 'intuition' is a label we use for our lack of ability to describe complexity. It is clearly difficult to demonstrate intuition other than as 'something we cannot explain'. These ideas have become some of the bedrock of discussion about expertise, and we will find them assumed, and referred to as facts, developed by others, and applied in many different ways.

Dreyfus has had his critics in the field of philosophy, yet his thesis about human learning not being able to be replicated by computers has not been seriously undermined to date. Barnette (undated), in his critique of 'What computers still can't do', comments:

For many scientifically minded philosophers, Dreyfus' repeated 'It can't be done' stance will be unsettling, yet in fairness, he does raise serious objections [to developing artificial intelligence] that deserve and challenge equally serious counterarguments, presented carefully (p.3).

Dreyfus' later philosophical proposals (2002b) attempt to show that there can be 'intelligence without representation' - that there does not have to be some sort of representation or idea in one's brain to enable one to cope with, or act in the world. This is an appeal to understand the importance of phenomenology in

scientific explanation. This philosophical argument has been reinforced by recent research on the brain, and how it works, for example, Damasio (2000).

Anthony (2002) disagrees with Dreyfus on the concept of conscious representations. Even she, however:

...finds Dreyfus' phenomenological characterisations of the progression from novice to expert thoroughly compelling (p.339).

Anthony (2002) also makes the point that in learning motor skills (rather than, say, reasoning skills), focusing directly on the particular motor skills we want tend to be counter productive. She describes learning to snowplough turn in skiing:

If you have a good teacher, you will be told to turn by trying to reach something beside you on the ground, rather than by (if you have a bad teacher) you will be told to shift your weight off the uphill ski and on to the downhill ski (p.400).

This echoes Polanyi and the need for 'focal awareness'. Rey (2002) suggests:

No sane representationalist denies that, somewhere along the line, representations give way to other non-mental processes (p.403).

Gallagher (1999) comments on Dreyfus' notion that an emotional involvement must accompany proficiency and expertise – she asks why a novice does not necessarily have emotional involvement, and suggests that an expert might have to be coldly detached in his role. Dreyfus (2002b) responds to these criticisms by pointing out that his argument about representationalism only refers to the experience of an expert in flow, not the other stages of learning. He agrees with Gallagher's description of some novices and experts, but reiterates:

*Only when one achieves competence is there emotional involvement in **choice of action** [his emphasis] (p.423).*

Dreyfus and Dreyfus (1986) introduce the idea of 'flow', which they describe as 'beyond rationality' (p.40). They further describe 'flow' as:

Brief periods when performance, accompanied by a feeling of euphoria, reaches its peak. Athletes describe the phenomenon as playing 'out of your head'. Flow [is] the cessation of monitoring activity that normally accompanies the higher levels [of skill] (ibid) .

Dreyfus (2002a) develops this idea further, suggesting that:

When I am acting in flow, I am in control of my movements in the sense that I can stop doing what I'm doing if I will to do so, and my movements are caused by the gestalt formed by me and my situation [and] that means the situation is experienced as drawing the appropriate action out of me (p.380).

Dreyfus (2002b) takes this idea another step by suggesting that:

Even when one is in flow, one at least has the sense that the situation and one's activity in it are evolving in a satisfactory way - that things are going well – otherwise, one would not be jolted into awareness when things went wrong by the sense that something abnormal was going on (p.421).

Further ideas about 'flow' are developed by Goleman (1996). None of the criticisms of Dreyfus' work seriously undermine his description of skill acquisition and expertise. Mostly focussing on technical and philosophical aspects of his work, they often take his description for granted. Scardamalia and Bereiter (1991) however, have an example they think does not fit the picture: they suggest that the commonsense notion of expertise treats it as a state - almost a state of grace - in which abundant knowledge and skill make it possible to accomplish with ease things that the non-expert can do, if at all, only with

difficulty. They point out that expertise in 'creative writing' does not fit this rosy picture:

Expert writers generally are found to work harder at the same assigned tasks than non-experts, engaging in more planning and problem solving, more revision of goals and methods, and in general more agonising over the task (p.172).

They suggest that studies of reading and writing bring out an aspect of expertise that is:

...typical of expertise as it is practised in the real world, but that tends to be hidden in most expert-novice research (ibid. p.173).

This argument also brings to the fore the question of 'when is an expert being an expert?' (even experts need to stop sometimes and eat, for instance) and the nature of how expertise is measured – often experts (such as in chess) are measured by their speed of action, or by problem solving in laboratory conditions, whereas expertise in writing cannot be measured in this way. The authors continue:

The least understood aspect of expertise is how it is acquired and perfected (ibid. p.191).

So far, we have described a model of how expertise is acquired in stages, how an expert operates, how emotion is an essential element, a link to 'tacit knowledge', a suggestion that expertise might be domain-specific and that the way expertise can be described needs further elaboration. Experts do not behave like experts all the time.

In their critique of Dreyfus' work, Selinger and Crease (2002) first suggest:

Dreyfus' model of skill acquisition is important because it shifts the focus away from sociological and technical externalisation to universal structures of embodied cognition and affect... he shows that expertise is a prime example of a subject that is essential to science but can only be fully elaborated with the aid of phenomenological tools (p.245).

They then comment that both Dreyfus' model and his normative claims are flawed due to the lack of hermeneutical sensitivity. They suggest that Dreyfus assumes an expert's knowledge has crystallised out of contextual sensitivity plus experience and that the expert has shed, during the training process, whatever prejudices, ideologies, hidden agendas, or other forms of cultural embeddedness, that person might have begun with. They conclude:

One would never imagine, from Dreyfus' account, that society could possibly be endangered by experts, only how society's expectations and actions could endanger experts (ibid. p.288).

Thus the idealised nature of Dreyfus' account is questioned. Can we see this account in practical learning as in dry stone walling?

Selinger and Crease (2002) also point out that Dreyfus' account admits certain categories of people as experts which do not belong, and omits several which do. To illustrate this, they point out that Dreyfus classes all humans who can walk or talk as 'expert' walkers and talkers. They suggest that in the real world we would only refer to 'expert' walkers and talkers as those of a more limited number of people who might have undergone special training, for example. Their second point about Dreyfus' omissions goes to the heart of the matter:

In Dreyfus' terms, 'expert x' corresponds to knowing how' whilst 'expert in x' corresponds to 'knowing that'. (thus, for example,) an expert in farming could effectively communicate, coordinate and synthesize accurate propositional information about farming (and be known as an expert), even if he were terrified of plows [sic] and tractors- an expert in sports might not be a good performer himself... an expert in music could be a terrible musician (p.258).

Expert commentators or coaches are therefore, in Dreyfus' terms, not experts.

The essential argument here, it seems, is whether expertise has to be situated in a social or cultural context. Selinger and Crease (2002) are persuasive:

The acquisition of expertise is not a transcending of embeddedness and context, but a deepening and extension of one's relationship to it (p.262).

In their view, one clearly can be 'an expert commentator'.

Dreyfus' account of expertise also does not explain how experts might disagree.

Turner (2001) points out that in order to be expert, someone needs not only to be skilled, but to have an audience that socially recognises his type of skills as skilled expertise. Although these points are salient, they can be seen to add to Dreyfus' work, rather than undermining it completely. Indeed, the philosophical debate continues. Dreyfus' account has been built on and applied in many fields, most notably by Benner in the professional field of nursing.

Approaches to expertise in sociology focus on, for example, expertise as related to professional groups and their development. Knapp (1999) suggests that 'access to an abstract discourse' is central to professionalisation processes. In other words, "the ability to have an abstract discourse seems an important part of a profession's claim to legitimacy" (p.587). However, how abstract discourse

actually works to advance, maintain, and expand professional jurisdiction remains underdeveloped. Knapp suggests that broadening the focus of abstract discourse to 'narratives of expertise' would help develop current theorizations of professionalisation:

If experts can successfully claim 'real knowledge', then that will be a great advantage in jurisdictional claims (ibid. p.607).

Thus we return to some of the difficulties in defining expertise. Is it a quality of a person - or persons - or is it a description of those qualities?

Collins (2004) attempts to address this issue at a philosophical level by suggesting that between formal propositional knowledge and embodied skill lies 'interactional expertise' – the ability to converse expertly about a practical skill or expertise, but without being able to practise it, having learned through linguistic socialisation among the practitioners. Interactional expertise, it is suggested, is exhibited by sociologists of scientific knowledge, by scientists themselves, and by a large range of other actors. Collins' analysis shows how Dreyfus sometimes confuses process and person. Dreyfus (2000) states:

There is surely a way that two expert surgeons can use language to point out important aspects of a situation to each other during a delicate operation. Such authentic language would presuppose a shared background understanding and only make sense to experts involved in a shared situation (p.308).

However, this might depend on the sort of conversation we are talking about. A conversation in learned journals is a very different conversation from one between experts 'in practice' – in this example, in the operating theatre.

Selinger and Mix (2004) point out that Dreyfus is right in his analysis of process, but that he errs in insinuating that only a surgeon can have the appropriate background understanding to experience the 'authentic' language of surgery. They further suggest that Collins thinks interactional expertise is a rather inferior form of contributory expertise, and that contributory experts (those who do whatever is under discussion) are always better at talking about it than someone who has just 'learnt the language'. They summarise Dreyfus' view:

Dreyfus not only suggests that experts do not follow rules when they act qua experts, but moreover, he indicates they make immediate discriminations that are difficult to express linguistically' (p.151).

Although Selinger and Mix allow some positive contribution from Collins' views, they conclude that he has:

Flawed, ontologically atomistic understanding of embodiment, his analysis depending on fictional contrivances... his account of interactional expertise still remains problematic (ibid. p.160).

So the philosophical debate continues. What does all this mean? Does Dreyfus' theory hold up? His linear model is appealing, but does not necessarily express the complexities of how learning takes place. There is a theoretical discussion of 'emotion in decision-making' by experts which is unresolved. It would appear that the complexity of describing expertise still can encourage different points of view at the level of theory. Can this model be usefully applied in the real world?

Benner (1984) based her acclaimed study of development of nursing skills on the work of Dreyfus. She applied Dreyfus' model of skill development to clinical nursing practice. This study has been, and remains, highly influential in this field, and bears some examination in that it not only applies Dreyfus' model, but claims

to be based on philosophical concepts: thus she refers to Heidegger (1962), also a source for Dreyfus and Polanyi. Rolfe (1997a), in his critique of Benner, points out that Schön's (1983) concept of 'reflective practice' is also strongly reflected in Benner's (1984) work, although Schön's work is of a later origin than Heidegger. Benner's (1984) work is important because it has been so influential, remaining a keystone in current nursing training. It is relevant here also because she is studying the actions of people, as well as their ways of thinking.

One might agree with the writer of the foreword of Benner's (1984) text that it is provocative – there is much evidence of that which will be explored here. One might question, however, the comments about:

The mystery of expert nursing practice, and the understanding it gives us of the need to respect this mystery, rather than pretend that we can dispel or standardise it by submitting it to rules, procedures or regulation (p.vi).

Benner first proposes a definition of expertise which is developed through experience, not just any experience, but a particular sort of experience which results when preconceived notions or expectations are challenged, refined, or disconfirmed by the situation. Know-how is acquired through this experience which is then evidenced in different problem-solving processes of novice nurses and proficient nurses. So we have learning by new situations throwing up new problems which have to be addressed, or a problem-solving approach. In clinical situations, it would be difficult to describe this as 'learning from your mistakes', although others (Dunphy and Williamson, 2004) have described the Dreyfus model this way.

Benner (1984) describes Dreyfus model as:

This model posits that in the acquisition and development of a skill, a student passes through five levels of proficiency; novice, advanced beginner, competent, proficient, and expert. These different levels reflect changes in (three) general aspects of general performance ...the first is a move from use of abstract principles to use of experience as paradigms (p.13).

We understand Benner's use of this term 'paradigms' to mean past concrete examples of whole situations which have been important enough to have changed the nurses' practice. Benner describes the second level of practice:

The second is a move from seeing many particular parts of a situation, but not seeing them in a joined up way, to seeing the 'whole picture'. The third is a passage from detached observer to involved performer (ibid. p.14).

It is important to understand these changes, as Benner uses them to expound what she sees as developing key parts of the nursing task - interventions and use of clinical judgement - and develops them in sections of the work on 'implications for teaching and learning'. Interestingly, Benner specifically excludes psychomotor skills from her suggested list of implications from this work, as she classes them as ones that can be '...demonstrable in a skills laboratory...' (ibid.p.14). She sees them as any other 'enabling skills' for the particular job of nursing. Whilst one might understand Benner not wanting to over-generalise, this view of psychomotor skills is in clear contrast to others' notions of expertise and skill development in other areas such as sport. (see, for example, Starkes *et al*, 2004).

Benner (1984) interviewed many nurses at many levels of competence, analysed the results and identified thirty-one competencies which were then classified into seven domains of nursing:

Through analysis, and following the Dreyfus model, it became possible to describe the performance characteristics at each level of development, and to identify, in general terms, the teaching and learning needs at each level (p.20).

Benner then takes us through her understanding of Dreyfus' 'levels':

Stage 1 – novice

Beginners have no experience of situations in which they are expected to perform... they are taught about situations in terms of objective attributes... and are also taught context-free rules (ibid. p.21).

These 'context-free rules' are said to guide action in respect to different attributes (of the situation), such as fluid balance (of the patient). These rules are therefore actually context-limited. The rules obviously have to be relevant in the teacher's view, and in the context of nursing. However, Benner says:

Following rules legislates against successful performance because the rules cannot tell them the most relevant tasks to perform in an actual situation (ibid. p.21).

There is nothing said here about a possibility of another rule, or about which rule to apply. Neither is there any discussion of why there might be any relevance to these rules. Benner simply appeals here again to Dreyfus' model as distinguishing between the (possible) different levels of skilled performance that come from classroom learning and those context-dependent judgements and skill which can only be acquired in real situations (*ibid.* p.20).

Stage 2 – Advanced beginner

Ones who can demonstrate marginally acceptable performance and who have coped with enough real situations to note the recurring meaningful situational components or 'aspects of the situation' (ibid. p.22).

Again, there is no discussion of the context here – who judges this performance?

Stage 3 – Competent

Competence, typified by the nurse who has been on the job in the same or similar situations two or three years develops when the nurse begins to see his or her actions in terms of long-range goals or plans of which she is consciously aware. The plan dictates which aspects of the current and contemplated future situation are to be considered most important and those which can be ignored. The competent nurse... does have a feeling of mastery and the ability to cope and manage the many contingencies of clinical nursing... There is a sophistic quality to the competent stage (ibid. pp.25-27).

This appears on the face of it to be stating the obvious, but Benner appears to be trying to describe the work context of the learner. The time frame referred to is stated as a matter of fact, but not justified.

Stage 4 - Proficient

Characteristically, the proficient performer perceives situations as wholes rather than in terms of aspects, and performance is guided by maxims (ibid. p.27).

Benner does not give clear examples of these maxims. She is referring to the work of Polanyi. Polanyi (1958) describes maxims as cryptic instructions that make sense only if the person already has deep understanding of the situation. Benner (1984) says:

Perception is a key issue here: the perspective is not thought out but presents itself [original emphasis] based upon experience and recent events. Proficient nurses understand a situation as a whole because they perceive its meanings in terms of long term goals (p.27).

The proficient performer considers fewer options (than the competent) and hones in on an accurate region of the problem:

The proficient nurse uses maxims as guides, but a deep understanding of the situation is necessary before the maxim can be used. Maxims reflect what would appear to the competent as unintelligible nuances; they can mean one thing at one time and quite another thing later (ibid. p.29).

Benner then follows with an example of weaning a patient off a ventilator – there is no evidence of a ‘maxim’ as in ‘cryptic instruction’ in this writing, however. Benner refers to maxims, but does not evidence them in her work. She suggests that proficient performance can usually be found in nurses who have worked with similar patient populations for approximately three to five years. Benner at least admits to this being an estimate at this point.

Stage 5 - Expert

Benner (1984) describes the expert nurse:

The expert performer no longer relies on analytic principle to connect her understanding of the situation to an appropriate action. The expert nurse, now with an enormous background of experience now has an intuitive grasp of each situation and zeroes in on the accurate region of the problem (p.32).

She then suggests, however, that:

Capturing the descriptions of expert performance is difficult, because the expert operates from a deep understanding of the total situation (ibid. p.32).

There are parallels here with other professions, such as police or fire fighters, where swift responses are necessary that cannot rely on textbook processes, or consciously thought out steps to decision-making (for example, see McNie, 2005). The complexity of subconscious learning processes described by Pinker (1997) and Jacobs (2000) are described, but in terms of ‘intuition’. We may be able to see demonstration of this sort of learning in dry stone walling which,

although clearly not in the emergency field, may well exhibit expertise as 'learnt intuition in practice'.

Benner (1984) says, for example, the expert nurse... "has an intuitive grasp of each situation" (p 32). This tallies with Dreyfus' model, and introduces the idea of 'intuition' as a component of expert practice. Intuition is essentially unspecifiable. However, Benner believes that:

...systematic documentation of expert clinical performance is a first step in clinical knowledge development (ibid. p.35).

She clearly believes that, although capturing the essence of expertise is difficult, it is not impossible.

Benner adds further that there is a discontinuity between the competent level and the proficient and expert levels, and that this is related to the 'holistic view' and the use of intuition. Benner also suggests that "...much clinical knowledge could only be *demonstrated* [her emphasis] as the particular situation arose" (*ibid.* p.41). Latterly Benner makes reference to the Dreyfus model:

...predicting that a certain level of commitment and involvement is necessary for a sense of salience to develop (ibid. p.164).

She suggests that nurses' practices and demonstrations of expertise challenge some of our ideology about maintaining distance from patients. Here she foreshadows later debates (see, for example, Redfern *et al*, 2002) about 'evidence-based' nursing versus 'reflective practice'.

Benner's work has had many commentators over the years since it was published. This continues to underline the importance of her work. At practice level, Hargreaves and Lane (2001) use an individual case study to demonstrate both the importance of the work and some criticism:

Delya's story illustrates many of the features of Benner's ongoing research. However she is considered competent by her peers within the 6 week period... this does not match the timescales suggested in the original research... Although it is stated within the work that the expertise is situational, this is presented as a statement of fact, rather than a subject for scrutiny and debate (p.391).

Dreyfus also mentioned similar timescales. We take this to mean relating to 'expert' expertise; clearly he did not mean that learning to ride a bike proficiently took several years. There are some implicit assumptions in the work of both Dreyfus and Dreyfus (1986) and Benner (1984) that need further exploration. Hargreaves and Lane (2001) conclude:

A linear model (of development) is not enough... It is necessary to take into account the individual themselves, as well as prior experience, expertise, and motivation (ibid. p.394).

They point out that Benner herself identified nurses who had more than five year's experience, but who did not fit the research criteria for 'expert'. Dry stone wallers may also demonstrate an example of how expertise accrues in many different ways over a period of time.

So whilst we have some people who become expert over a period of years, some do not. The importance of context in Benner's work is not fully explored. Thus

although Benner's work has been used in a wide variety of contexts, the importance of variations in contextual element has not been taken into account.

Another practice level study by King and McLeod (2002) looked at the role of intuition and the development of expertise, particularly focusing on intuition shown at levels of expertise other than the 'expert' level, where Dreyfus originally identified it. They find that:

Burgeoning intuitive aspects of decision-making may commence in nurses at an early point in their career and strengthen or lessen with time, depending on their experiences and developing expertise (ibid. p.323).

They conclude:

The difference between expert and non-expert decision making appeared to lie not in the presence or absence of intuition, but rather in the expert's ability to use intuition more skilfully and effectively... intuition informs and enhances logical thought and therefore should be responded to (ibid. p.328).

We are returned here to the debate about the personal aspects of the nature of expertise. This case study reports specific 'intuitions' in nurses such as 'intuitions that something was wrong with the patient'. It is difficult to find explanations for these in terms of expertise. If intuition is important, if feelings are important (and all human beings have feelings), then as King and McLeod say, it is present in nurses, expert and non-expert. How we use that intuition is not explained.

In another recent practice level study by Uys *et al* (2004), comparing the problem-solving competency of nurses following 'problem based learning curricula' versus a 'non-problem based learning curricula', they find:

Competence was identified as the advanced beginner stage of professional development... this was done because competence level as defined by Benner cannot be expected from new graduates (p.501).

Here we have a new definition of competence. The authors identify the importance of practitioners' assertiveness in moving towards competency, but Benner's stages of skill development remain, however, unquestioned. In another critique, Rolfe (1997a) describes Benner's approach thus:

The expert, however, has a combination of knowing how and knowing that, and it is therefore the acquisition of know-how or personal, experiential knowledge that separates the expert from the novice... Expertise then is concerned with working intuitively, with responding to practice situations holistically, from a body of personal, tacit knowledge, a repertoire of past paradigm cases, what has been called the art of nursing (ibid. p.94).

Rolfe then suggests that Schön's (1983) approach could be used to develop a further stage in the levels of expertise:

This sixth level is almost the antithesis of expertise. The expert nurse would perform the required actions... without conscious thought, whereas the reflexive practitioner would think about every move, every decision... nurses would be learning from their performance thinking about how it could be done differently (Rolfe,1997a, p.96).

We are still left with questions of where and when we decide to describe a practice as expert, how long it might take someone to become expert, and whether the 'unconscious' element of expertise can be explicated. Rolfe does admit that reflexive practice is difficult to pin down. Learning is complex, and the theoretical approaches still entail conflicting views: Detailed studying of dry stone walling may be expected to provide rich examples of this complexity and confusion.

In a more philosophical vein, Rolfe (1997b) suggests we can elucidate Benner's formerly impenetrable concept of 'intuition' by employing 'fuzzy logic' or logic

based on fuzzy rules. However, these fuzzy rules seem to be based only on feelings: "We only have one decision rule: **I'll do it if it feels right**" [author's emphasis] (p.1071) and "You feel or intuit the centre of mass. It pulls you or inclines you" (*ibid.* p.1071). Rolfe continues:

Fuzzy logic does precisely what Dreyfus and Dreyfus are saying cannot be done: it weighs up scientific facts and theories, previously encountered situations and personal knowledge of the individual patient and comes to a rational decision based on all of these diverse factors... it seems likely that the expert nurse works in a similarly fuzzy way (ibid. p.1074).

The evidence for this assertion is thin. Although a computer can now fly a plane (Rolfe's chosen example in this article), this does not mean that human expertise in the field of nursing is as simple. We are returned here to Dreyfus' (1972) argument that computers cannot do what humans can do. Rolfe gives a classic example of a 'maxim' in referencing an early example of expertise from the 4th Century B.C.:

In making a wheel, if you work too slowly, you can't make it form. If you go too fast, the spokes won't fit in. You must go neither too slowly nor too fast. (ibid. p.1070).

English (1993) in a general critique of Benner, disputes Benner's proposition on the role of intuition. He cannot find, from Benner's work:

At what stage enlightenment (and cognitive reorganisation) suddenly befalls the 'proficient' nurse and she is transformed into an expert... nor what catalyst brings about the conversion (p.389).

He points out that intuition can refer to either unexplained knowledge, or unexplained perceptual processes and suggests the many examples of nurses

'noticing that something is wrong' is the key example of 'intuition' given in nursing. He continues:

To imply that insightful and attentive recognition of patient's needs derive from anything other than diligent observation, sound clinical knowledge, and experience is denigrating to the majority of nurses (ibid. p.392).

He points out that Dreyfus was primarily referring to decision-making, but Benner is referring to perceptual processes. This appears a valid criticism of many of the examples given of expertise in nursing, and given all the possibilities of difficulties in 'post facto' recall of situations, would appear to merit searching for more evidence of 'expertise in action' evidenced by what the person involved actually did, rather than what they felt at the time. Herbig *et al* (2001) point out that 'intuition' refers to tacit knowledge acquired during experiences in a special (specific) domain, and that the reliance on this strongly relates to so-called experience-guided working. In passing, they give this definition for experience: "Experience means the development of a holistic and flexible anticipation characteristic" (p.689).

This intriguingly seems to fit what other authors call 'intuition'. The authors tested whether nurses who successfully deal with a critical nursing situation differed in their level of tacit knowledge from those nurses who were unsuccessful, and attempted to explain the difference. Interestingly, they found that successful nurses used feelings positively, and unsuccessful nurses found feelings obstructive, and also that:

Successful nurses had a holistic view of the test situation described, whereas unsuccessful nurses seem to have a sequential organisation of their tacit knowledge and seem to use a sequential-analytical procedure in dealing with the situation (ibid. p.694).

Whether Polanyi would believe that laboratory testing for 'tacit knowledge' is possible or appropriate remains to be seen.

Cash (1995) offers a philosophical critique of Benner's methodology and her interpretation of nursing. He recognises that Benner provides the most sophisticated critique of the rationalist tradition in nursing, and then explores the philosophical bases of her work, quoting extensively from Heidegger (1962) and Dreyfus' (1991) interpretation of Heidegger. He also identifies a problematic aspect of Benner's work: i.e. whether the word 'expert' applies to the skill in context or to the person - and points out that Benner shifts ground in her later work. He makes a distinction between 'critical incidents' and 'typical incidents' (which Benner distinguishes and comments upon in her own work) but suggests that Benner's examples may be simply 'typical' as the textual evidence is not available. This is a methodological as well as a philosophical point – how much text of interviews do you evidence? Cash then suggests that there is a problem with the status of the coders of Benner's text 'who are defined socially'. This is obviously true but is not evidenced by Cash. Who should do coding? Someone has to. Presumably they must have some social standing; otherwise any researcher would use anyone to do coding. Cash then suggests we need to separate out the internal world of nursing from the wider context 'such as its relationship with medicine'. This is an interesting suggestion, but Cash sits

uncomfortably in the middle of his own critique – the wider context of nursing is the whole world we live in, not just the narrow socially defined power relationship between nursing and medicine. There are indeed examples of the overlapping worlds of medicine and nursing scattered in Benner's accounts, and questions to be raised about 'nursing expertise' being about 'intuition' or about 'doing something with that intuition' – Dreyfus was clear on this point, Benner is not.

Cash (1995) concludes in a rather stark manner:

Benner's focus on intuition fossilises practice distorted by unequal power relationships (p.534).

Benner (1996) replies to Cash (1995) by referring to her own later work as in:

The feminist tradition of bringing into public discourse poorly articulated areas of knowledge [and] skill (p.670).

Benner (1996) appears to have moved some of the ground from her earlier (1984) work. She then (correctly in my view) points out that Cash's description of Heidegger is a scientific/positivist reading, and then defends the coding process for text by stating:

As much of the narratives as are necessary are published so that readers can participate in critique and validation (ibid. p.671).

Here we are reduced in the Cash - Benner debate in a simple difference of opinion, on the use of different models - of power analysis and interpretative phenomenology. Benner attempts to resolve this by pointing out that both models might be applicable. She accepts that Dreyfus' model of expertise is situational, 'not related to traits', and then tries to ally the two by suggesting:

One who performs excellently in most situations might be considered an expert (ibid. p.671).

Considered an expert by whom, and when? The problem of describing an expert as a person or a set of skills still looms large. Can dry stone walling add anything to this picture?

Paley (2002) takes up some more criticisms of Benner and her more recent work. He points out that Benner's work (along with its assumptions), has a hidden 'culturalist assumption' – i.e. that certain understandings and practices are bestowed on us by our 'culture'. He then points out that this position has its difficulties in that the idea that a culture is an "...integrated system of meanings" (p.571) does not hold water - cultures are not 'things'. The debate about Benner's philosophical stance remains. Horrocks (2002) writes on the philosophical differences between 'ontological' and 'intentional' care following the debate between Benner and Wrubel (1989) and Edwards (2001). Benner and Wrubel (2002) respond to Horrocks, and so the debate continues.

Yet Benner's ideas continue to be used as a commonly understood factual basis of descriptions of practice: Daley and Carnwell (2003) refer to her work in describing the proliferation of nursing roles in the last ten years in the UK. They acknowledge that:

Many years of knowledge acquisition and experience are required for the development of the perceptual-motor elements of expert practice (p161).

Benner (1984) specifically excluded this from her definition of nursing expertise.

Daley and Carnwell (2003) identify two distinct role-related domains of nursing practice that extend beyond those previously identified by Benner and suggest:

Other elements that are common to both types of practitioners [clinical nursing specialists and nurse practitioners] is that they practise at higher levels than elementary practitioners (p.163).

Are they seen as being in a senior position with more money and power, or are they more expert? We are not enlightened. In addition, nurses in these domains:

Are viewed as experts in their respective domains and engage in practice which involves sophisticated use of knowledge and skills (ibid. p.163)

Their study is actually referring to current arrangements for nurses to advance their practice vis-à-vis doctors.

Taylor (2003) examines two dominant approaches to health and welfare studies, usefully pointing up the differences between 'evidenced based practice' and 'reflexive practice'. She refers to Benner's and Schön's work on reflective practice and then underlines their importance:

[Claims to the importance of reflective practice] have been widely accepted and built into the educational frameworks of both nursing and social work (p.246).

She underlines some of the criticisms of 'reflection-on-action' (a term coined by Schön to describe looking back at critical issues and analysing them as learning points, as did Benner), underlining the usefulness of reflexive practice in that it:

...seems to get much closer to the minutiae of everyday practice than does evidence-based practice (ibid.).

She also asserts that new criticisms of the approach have been made in that it is an “incitement to confess” (*ibid.*) and therefore a “form of surveillance” (*ibid.*). She raises concerns about “the unreflective way we treat reflective practice” (*ibid.* p.250) and argues for the need to be “conscious of what is said and how it is said” (*ibid.*).

Nelson and McGillion (2004) take the use of narrative further and bring us to a different perspective on Benner:

... [her text] is a self-conscious political attempt to move beyond the abstractions of nursing theory, and to drive politically a positive articulation project practising nurses... our position on expertise, a highly contested notion, is not the focus of his paper. Rather we will use expertise to examine the profession's wide and uncritical 'uptake' of narrative as a means to uncover practice (p.634).

The authors then take us through a critique of Benner's more recent work, pointing out that:

...rather than viewing these narratives as illuminating the world of practice, we argue that they produce a palatable and highly desirable discourse about practice for a nursing audience (ibid. p.637).

So where does this leave us? Dreyfus' ideas about expertise and the stages of development of expertise embraced by Benner are fundamental to current nursing theory and practice. Narrative case description and self reflection is well grounded in nursing. Nurse training involves explicit reflective accounts of personal incidents which have become regarded as essential to learning - what are now seen as 'critical points of development'. These have in themselves been criticised as 'unreflective use of reflection' and a way of helping the nursing profession to be seen internally and externally as a universally positive thing. An

overview by Redfern *et al* (2002) on 'assessing competence to practise in nursing' has many references to Benner, pointing to the difficulty in knowing at what level competence should be assessed, but acknowledging:

... [Benner's] intuitive appeal to nurses in that it 'makes sense' [and] its flexibility which makes it applicable to a range of clinical and educational settings (p.64).

Redfern *et al* (2002) ground other assessment approaches in the work of Schön and Polanyi and in a very relevant comment, point us back to the importance of situation or context:

Conditions in the workplace need to be right for reflective thinking to be successful, and this needs collaborative working between teachers, employers and practitioners (ibid. p.65).

Thus we come back to one particular criticism of Benner's work. Although it has an appeal, it does not explore fully the *context* of expertise. One might, in reviewing the use of the Dreyfus' model, point out that Benner followed the model uncritically, and that any criticism of Dreyfus' would also apply directly to Benner's work. Concrete examples of the application of this model show how there are still wide variations in real life. The model stresses intuition, but focuses on competence. The model has a clear set of stages which are not borne out by reality. Timescales of expertise acquisition vary. Individuals vary. Perhaps the real world is more complex?

2.4 Schön and Reflection

Schön's (1983, 1987) influential studies of learning Architecture and Design are referred to in many other contexts. Indeed, Schön himself would suggest that his work does have much wider implications than the context from which it emerged.

He argues that:

Skilful professional practice often depends less on factual knowledge or rigid decision-making models than on the capacity to reflect in situations of uncertainty, uniqueness, and value conflict (1987, p.35).

In attempting to define 'a new epistemology of practice' (*ibid.* p.xi) vis-à-vis systematic, preferably scientific knowledge and technical rationality, he describes the 'essential nature of reflection-in-action', in practice 'where situations of uncertainty and complexity demand the imposition of an order' (*ibid.* p.65). He also coins the term 'professional artistry' to refer to the "kinds of competence practitioners sometimes display in unique, uncertain, and conflicted situations of practice" (*ibid.* p.22) using such diverse examples as teaching Design, Music, Architecture, Psychoanalysis and Counselling. Dry stone walling may be able to add to this picture. Schön (1988) also emphasises the importance of 'framing the problem'. His ideas spring from a concern about the gap between good professional practice and how and where this is taught. Schön believes there is a gap between academia and the real world. He also stresses the importance of tradition.

Cross *et al* (1994) in their review of design expertise, comment:

There is still precious little understanding of the differences between novice and expert performance (p.429).

They refer in passing, however, to different phases, the need for good scoping and problem-definition, solution conjectures rather than problem analysis, opportunistic behaviour, and frequent switching of types of cognitive activity.

Waks (2001) reviews the work of Schön thus:

Among our generation's most influential philosophers of design and design education, yet remains uncelebrated in both philosophy and design education (p.37).

He expounds the nature of Schön's work in 'framing and reframing' (*ibid.* p.44), and emphasises the importance of 'coaching, heuristic teaching and facilitating learning by doing (*ibid.* p.47).

Schön's (1987) solution to the problem of 'rationalist' teaching in universities was to create a 'practicum', half-way between the academic setting and the real world. This allowed:

Freedom to learn by doing in a setting relatively low in risk, with access to coaches who initiate students into the 'traditions of the calling' and help them, by 'the right kind of telling' to see what they most need to see (p.17).

Schön's ideas have been enthusiastically embraced in many spheres of activity. Whether they take us further than the design studio remains to be seen. There is much conscious activity in Schön's work. The non-conscious processes are not emphasised.

Dry stone walling is not generally perceived as a professional activity, except by those who perform it. However, Schön's work may be seen as relevant in that it emphasises reflection, both whilst performing a task (reflection-in-action) and reflection after a task (reflection-on-action). At a high level of expertise, Schön suggests that:

A skilled performer can integrate reflection-in-action into the smooth performance of an ongoing task (ibid. p.29).

There are parallels here with the concept of 'flow' (as described by Goleman, q.v. section 2.6.6). Can we evidence this in learning in real life in dry stone walling? Certainly, we do not need Schön's 'design studio', as the creative situation in walling is the real 'field' situation. Rehearsal is much less differentiated from practice in walling than can be the case in Architectural Design or Music.

2.5 General Theories of Expertise

2.5.1 Introduction

This section will explore the importance of general theories of expertise, and their implications for dry stone walling.

2.5.2 The Importance of Expertise

Selinger and Crease (2002), following Dreyfus, stress the importance of expertise:

Expertise is of central importance to contemporary life, in which many economic, political, scientific and technological decisions are routinely delegated to experts...apart from its social implications, the issue of expertise is also philosophically important... it bears on the philosophy of

mind... it crystallizes the conflict between two traditions, classical philosophy of science, and Science and Technology studies (pp.245-246).

Atherton (2003) provides a brief summary of some of the complex aspects of expertise; following Dreyfus and Benner, he suggests that the Dreyfus model does not account for the personal aspects of expertise:

It is quite possible to imagine people who might meet the criteria for Dreyfus' stage 5 but who are still consistently wrong or incompetent. (p.3).

He acknowledges Schön's work on reflection-in action, but points out that reflection is perhaps a necessary condition, but not a sufficient cause:

Reflection is just as likely to produce unrealistic untested delusions (or self-condemnation, or self-justification, or blame) (ibid. p.5).

He then suggests 'an informal model' of competence, based on three aspects: ability and contextualisation (knowing when to do what), contingency (knowing what to do when things go wrong) and creativity (the capacity to use skills in new ways to solve new problems). This superficially attractive model, at a simple descriptive level, is not amenable to empirical testing. Atherton concludes that it is an open and debatable question as to whether expertise can be taught.

Ericsson and Smith (1991), in attempting an overall theory, acknowledge the difficulty of defining an expert person by characteristics. Depending on the historical period and the type of activity involved, such individuals have been labelled exceptional, superior, gifted, talented, specialist, expert, or lucky.

After defining expertise as 'outstanding performance within a domain' (p.13), which may be attributed to relatively stable characteristics of individuals, either acquired or inherited, they attempt to synthesise some ideas about outstanding performance. They suggest a variety of different ways of accounting for this, on the dimension of 'inherited general characteristics to inherited specific abilities', to 'acquired or learnt characteristics of a general nature', to domain specific training. They relate these to constructs and appropriate research approaches (Table 2.1)

Attribution	Construct	Research approach
Primarily inherited General abilities	Intelligence, personality	Correlation with personality profile, general intelligence
Primarily inherited Specific abilities	Music and artistic ability Body build	Correlation with measures of specific ability
Primarily acquired General learning and experience	General knowledge and cognitive strategies	Investigation of common processing strategies
Primarily acquired Domain-specific training and practice	Domain or task-specific knowledge	Analysis of task performance i.e. the expertise approach

Table 2.1 Different approaches to accounting for outstanding performance

(From Ericsson and Smith, 1991, p.4).

Much of the research referred to on inherited characteristics is about memory or general intelligence (however measured). This research approach is said to have been largely unsuccessful in identifying strong and replicable relations, and the search for links to specific inherited abilities has been similarly inconclusive.

Examples of achieving perfect musical pitch, and anatomical characteristics of athletes indicate the difficulties of making links to acquired skill. The timeframe for acquiring expertise is summarised as being 10 years or more, with evidence from many domains that most 'international level' performers had been seriously involved in their domains before the age of 6 years. The 'expertise approach' is said to be an attempt:

To describe the critical performance under standardised conditions, to analyse it, and identify the components of the performance that make it superior (Ericsson and Smith, 1991, p.8).

This leads to the difficulties of identifying precisely those 'standardised conditions' and 'identifying the components'.

Ericsson and Charness, (1997) describe the minimum time to develop expertise as being ten years, whether this is for chess, sport, or art. They emphasise the importance of 'practice activities' to maintain expertise and describe the generalisable empiric finding that "practice of four hours a day is the most that can be sustained" (p31). They suggest that the peak age for creative achievement varies from domain to domain (as might be expected, say, with physical activities) and concludes that the traditional view of talent, where successful individuals have innate abilities and basic capacities, is not consistent with the reviewed evidence. Thus we first encounter the 'democratic' theory that anything can be learnt or acquired, given enough time and opportunity.

Sternberg (1997) sets out the 'received views' on expertise: the general-process view, the quantity of knowledge view and the 'better organised knowledge' view.

He then concludes:

Within a given domain, people have a shared conception of what an expert is... Expertise is a multifaceted phenomenon (p.160).

Stein (1997) develops ideas about expertise in a social context, describing how expertise can be seen to be a function of a 'constituency' (such as a peer group), or could be seen to be related to consumers in a market context. He summarises:

An expert is more than the sum of his or her cognitive abilities and skills – he or she is also codefined by context (p.192).

Agnew *et al* (1997) take this a step further, attempting to refine expertise into two levels, the first level being one where the expert has 'socially selected knowledge' and the second (and higher) level where the expert has 'reality relevant' knowledge. Although this is superficially attractive, this approach does not deal with the 'how to' aspects of expertise. The authors suggest "some experts come and go like fads" (p.239). This does not sit easily with a wider view of the importance of expertise (see, for example, Faulkner *et al* 1998).

Holyoak (1991) attempts to reframe many of the problems associated with a 'general theory of expertise'. In doing so, he starts from what experts are said to do (see Appendix 4) and then lists exceptions to these generalisations, finding that there appears to be no single 'expert' way to perform all tasks: "an expert is someone who is capable of doing the right thing at the right time" (p.309).

Hoffman *et al* (1997) attempt to summarise what is agreed about expertise:

*The phenomena are multifaceted, process-like, and flexible.
Context is necessary in defining knowledge and reasoning.
Social factors are not 'mere' context.
The exercise of expertise involves complex and dynamic nestings of
actions, and social situations (pp.573-4).*

This appears to be a good summary of the complexities involved.

Faulkner *et al* (1998) discuss a wide range of issues and perspectives from society's need to rely on experts, through expertise at work and cognitive science's attempt to understand the mental processes bound up with attempts to model these processes and the sociology of scientific knowledge, to feminist epistemologies. They conclude:

Different disciplinary perspectives tend to be characterised by competing and often incompatible epistemologies) [and that] there may be divergent approaches within a single discipline (p.20).

In a criticism of this writing and others by David and Christie (2000), an attempt is made to clarify some of the complexities raised:

Many people have acquired a high level of problem solving ability (the psychologists' definition of expertise). Far fewer people by virtue of such knowing, give the kind of counsel which cannot legitimately be shunned. To use the same word [expert] to describe these two people has caused dispute (p.371).

Dunphy and Williamson (2004) focus on expertise development in the area of healthcare. They review the key characteristics of expertise from different domains (see Table 2.2) and then critically compare three educational models. From these they attempt to develop a new model of education.

Area	Feature of expertise
Pattern recognition	Recognition of complex patterns
Knowledge	High levels of declarative and procedural knowledge Organised reflecting a deep understanding Conditionalised on sets of circumstances Can flexibly retrieve with little attentional effort
Skills	Performance skills may be automatic
Cognitive space	As knowledge automated, additional cognitive space available for deliberation
Metacognitive monitoring	Skilful/automatic monitoring of whole situation
Teaching ability	Not necessarily good teachers
Flexibility	High levels of contextual flexibility Can consider more possibilities than average practitioner Varying levels of flexibility in approaches to new situations

Table 2.2 Characteristics of Expertise (from Dunphy and Williamson, 2004, p.109).

The three models they compare can be summarised as:

Model	Characteristics
Trial and error	Studies in nursing, theoretically grounded in Dreyfus and Benner 5 stages from novice to expert.
Skill Acquisition 1)	Studies in psychomotor surgical skill acquisition, from medical literature theoretically grounded on Fitts and Posner. Three stages: cognitive, integrative, autonomous.
Skill acquisition 2)	Zone of proximal development from educational literature grounded in Vygotsky. Four stages: assisted learning, non-assisted learning, automatised performance, de-automatisation and recursion.

Table 2.3 Models and their Characteristics (summarised from Dunphy and Williamson, pp.111-117).

They rightly point out that in the trial and error model there are a number of educational deficiencies. This is not surprising, as the Dreyfus model was not developed from an educational standpoint. In their criticism of the use of Fitts and Posner's (1967) ideas in surgical skill development, Dunphy and Williamson (2004) are rightly concerned that sweeping generalisations in the use of the model might be inappropriate. For example:

Some skills such as surgical operations cannot and should not be performed without cognition (p.120).

The authors sum up with some very relevant points. Firstly and generally, we may not be able to assume expertise from the amount of time spent in a field. Secondly, particularly in the medical education field, is expertise about rigorous

training, or voluntary restriction of practice to a smaller area of practice? Thirdly, do any of these models reflect the neurological and physiological processes by which expertise is acquired? The fact that these unanswered questions remain at the end of a rigorous (and recent) review in a specific area demonstrate the complex and multi-faceted nature of expertise.

So what are we to make of this? We have different models, different perspectives and different definitions. It is clear that the area of study of expertise is complex and multi-faceted. Different streams of debate can be identified, and some particular debates over definitions continue: e.g. debates about levels of skill (what can be achieved by many, and what can be achieved by only a few?) and the stages of acquiring a skill (how many stages, what differentiates them?). Is expertise socially defined (by public or peers), or is there some more objective measure possible? Is expertise about knowledge or ability, or the uses to which they are put? When is an expert being an expert?

Williams *et al* (1998) bring together some of the more recent thinking on expertise and suggest there is beginning to be some way of integrating the various perspectives into a 'partial framework'. Thus expertise in itself is now an established concept for analysing practical and educational situations. Expertise is becoming a recognised issue in a range of scholarly disciplines. It is the subject of current debate, with no easily agreed definition. However, we may be able to explain it further in our study of dry stone walling, as demonstrating 'learnt intuition in action'.

Fleck's (1998) contribution in attempting to map what he describes as the three main aspects of expertise: knowledge, tradeability and power, as a 'triad relationship' is said to be the nearest we have got to locating, and relating together, different disciplinary approaches to expertise:

Both the focus and the basic epistemological assumptions clearly vary amongst the disciplines, with cognitive psychology and AI (Artificial Intelligence) according more importance to the substance of what is practised as expertise, economics and management of innovation according more importance to issues of market transactions, and labour process and other critical theory according more importance to the capacity of competing social groups to define their own practices and views of the word as legitimate (p.20).

Sloboda (1991), in trying to address some aspects of 'musical expertise' concludes by suggesting that this particular form of expertise is different from others in that it requires an apprehension of a structure-emotion mapping. Scardamalia and Bereiter (1991), describing 'literate expertise', point out that this form of expertise is "...a notable exception to the general picture of expertise" (p.172).

Stein (1997) says:

Viewing expertise from a contextual view provides a way to explain aspects of expertise that do not fit neatly in to cognitive psychological models (p.192).

Senker (1998) returns to the usefulness of tacit knowledge in that it is integral to innovation in emerging technologies, and suggests:

That the combination of tacit knowledge and skills appropriate to a specific context might be better described as expertise (p.241).

Thus the ideas propounded by Polanyi continue to be seen as useful and relevant, even in this most recent context. Fook *et al* (1997) refer to Holyoak's (1991) contribution, which argues that none of the commonly understood characteristics of expertise can be claimed to be a universal characterisation of expert performance. They then point to the importance of 'domain specific expertise and qualitatively different areas of performance' (p.402). Harris and Nicholson (1998) celebrate the political complexity and contradictions of psychological expertise. Van Der Heijden (2000), in a major research work, attempted to develop a measurement tool based on the idea that some characteristics of expertise are valid, regardless of domain. Based on ideas about knowledge, meta-knowledge, domain, social recognition, and 'growth and flexibility', this interestingly shows that even given a well worked out tool, used across several organisations, results differ dramatically depending on the perspective of the respondent, whether they are an employee or a supervisor.

Gavin (2001), writing about musical expertise, acknowledges that the examination of expertise is fraught with difficulty. She concludes that not only is there no clear evidence of an innate factor, but also that it is not simply environmental issues that lead to musical ability manifesting itself.

So where does this leave us? Expertise is still a contested area of debate. It is complex, and multi-faceted. It operates within various contexts. There is no one way of viewing it. Our working definition for our study is 'learnt intuition in action'.

2.6 Studies of Expertise in Specific Contexts

2.6.1 Introduction

There are areas of expertise that could in some ways be similar to, and have skills that might overlap, those of dry stone walling. These include sport, music, surgery, education, psychology, and crafts such as thatching.

2.6.2 Sport

Writing in the domain of sport expertise concentrates largely on learning, hand-eye co-ordination, or other muscle-eye co-ordination. Attempting to extract some understanding or underlying principles from this is very complex. For example, in a historical perspective on sports expertise, Summers (2004) suggests that future research will need to integrate our understanding of the neural basis of behaviour into other theoretical accounts, and that future theories will need to integrate information at the psychological and physiological levels. Boyle and Ackerman (2004) point out the large differences in changes within an individual as they learn, and also between individuals. Since Ericsson *et al* (1993) first studied 'deliberate practice', much work has gone into trying to measure this, and attempting to predict its usefulness. Ward *et al* (2004), in their criticism of this work, point to the importance of genetics in shaping the tendency to practice, and shape the amount of an individual's practice.

Fitts and Posner (1967) proposed a three-stage framework of skill learning: in phase one, a task making strong demands on attention and cognition, performance is slow and mistakes occur. In phase two, the elements of a task

are combined into units that allow for streamlined performance and a reduction in attention and effort. In phase three, performance becomes more 'proceduralized' and automatic.

As Boyle and Ackerman (2004) suggest, however, relatively few studies of individual differences have been conducted that shed light on the ability determinants of skill acquisition. Beilock and Carr (2004) note that the Fitts and Posner's characterisation of skill development has been extremely influential, but that this framework is mostly descriptive, and alternative explanations of skill acquisition are available and also have merit. Janelle *et al* (2004) state that the discussion on the need for 'attention' in skill acquisition, and how this changes as the performer becomes more skilled, is still subject to much debate. Mark Williams *et al* (2004) suggest that all of this complexity means that, although we know that motor skills can be taught and that perceptual and cognitive skills can be developed through training, the key factors underlying the design, implementation and evaluation of such training programmes have yet to be adequately outlined. Irwen *et al* (2004) studied the role of reflective practice within the context of sport, and interestingly highlight the importance of mentor coaches and trial-and-error methods of learning. Maxwell *et al* (2000), in another study, suggested that the accumulation of specific rules may have a negative effect on subsequent performance. Davids *et al* (2000) say that although much work has focused on biodynamics and motor control in sport, these studies have not been able to be applied in the 'real world'.

Writing on expertise in sport often focuses on 'movement' and the refining of particular motor skills. Allard and Starkes (1997) suggest that:

Skill in knowing and skill in doing are essential components of human skill (p.148).

A useful review of skill acquisition in sport (Handford et al 1997) considers the 'computer model' for the human body and brain:

Consider the task of acquiring skill in a tennis forehand stroke, the problem for the learner is one of co-ordinating the many independent muscles of the upper and lower body (800) which are acting around numerous joints (100). This huge number of system degrees of freedom actually represents a 'curse' for computational accounts... the problem is compounded when we consider the variabilities in anatomical and mechanical properties and physiological processes induced by the rapidly changing contexts typical of sports and exercise activities (p.623).

So we have not advanced in understanding of motor skill acquisition and we have not progressed much beyond the level of description in the motor learning field. Understanding and explaining the learning processes have seldom been addressed.

Even in very simple skills, such as hammering a nail, Latash (1996) noted considerable intra-individual variability in the movement of joints compared with the end-point of the movement – the tip of the hammerhead – has been noted even after many years of performing the skill.

Dickinson et al (2004) refer to the moment where, after several unsuccessful attempts at a task, "I suddenly got it" (p.63) or "All at once I got the hang of it" (*ibid.*) but find that in complex skill acquisition, the results indicate a complex picture of results so that:

It may be the case that some learners experience the 'Aha' phenomenon, but these may constitute a small minority (ibid. p.82).

Most recently, Moe (2004) brings us back to the central theme of expertise in sport, comparing Dreyfus' approach with an information-processing approach. He suggests that Dreyfus' model is more persuasive, as the phenomenological argument is more persuasive 'per se'.

So what are we to make of these sports studies? We find traces and echoes of 'stages of learning'. Much use is still made of 'scientific' laboratory-based studies. Many studies still focus on 'biomechanics'. However, there is still much yet to be understood about how the human body 'does things' like catching or hitting a ball, and clearly much variation in 'the best way to do it'. Complexity is clearly and practically in evidence here.

2.6.3 Music and 'Practice, Practice, Practice'

Music, its practice and its practitioners are a rich source of studies in expertise, as one might expect. Performance in music is essentially a demonstration of the skill of the practitioner. Cognitive and memory processes are involved in learning a skill that needs hand-eye co-ordination of a complex nature. Sloboda *et al* (1996) state their case very directly:

Practice is a vital ingredient of human expertise. Practising on its own may be insufficient to produce the highest levels of mastery at a skill, and it has long been established that mere repetition does not necessarily lead to improved performance ... but sustained practising is nevertheless essential in order to establish high levels of competence at most, if not all, areas of expertise (p.287).

Clearly there may be applications to learning other things than music – and learning which *becomes instinctual* when practised, may well be demonstrated in dry stone walling. How much practice, of what sort? Sloboda *et al* (1996) demonstrate a strong relationship between achievement and the amount of formal practice undertaken. In addition, they state:

High achievers tended to be more consistent in their pattern of practice, and tended to concentrate their technical practice [the intrinsically least rewarding] in the mornings (ibid. p.287).

This application of practice does not compare in a simple way with dry stone walling, although one might on the face of it agree that technical practice is less rewarding – repetitive practice cannot of itself appear to be attractive. The suggestion that times of day are relevant to different sorts of practice, however, is interesting.

Drake and Palmer (2000) describe novices' performances as:

Frequently interrupted by pauses, corrections, and duration errors... Skilled performers require less processing time, and so performance is accurate in relation to both pitch and time (p.3).

Simonton (2000) studied the careers of classical opera composers and their works 'at the top end' of expertise. He suggests:

Even the most awesome creative geniuses may have merely studied harder and longer than their less remarkable colleagues (p.284).

He finds the most prolific composers required less time to attain the mastery necessary. Creative careers tend to rise and fall, contrary to the 'simple expertise-acquisition process'.

Theoretically, artistic creativity is not the same as sport. For example, the artist produces 'different products' whereas the gymnast produces 'more of the same'... also artists must:

Not produce too much difference, otherwise the product becomes incomprehensible' ... creative products are defined by a larger number of dimensions... the artist works by much 'trial and error'... the creator seldom receives the most informative environmental feedback (ibid. p.290).

He concludes:

In this picture, only someone with almost infinite wisdom could figure out that the time is ripe to compose a symphony more than an opera (ibid. p.313).

Simonton demonstrates that there are many variables at play here, and artistic endeavour is difficult to analyse in any simple way. The regularity with which some variables reoccur still points us in certain directions. The importance of deliberate practice, in whatever form, remains.

Hallam (2001) suggests the (first) key strategy is to simply play the music through. Later, errors are identified and corrected, then errors are responded to by repetition of small sections that include the error and finally difficult sections are identified and practice concentrated on those sections. To add difficulty to our understanding of this process: "Students may report use of strategies while not implementing them consistently" (p.20). She concludes that the complexity of the factors that affect progress, and the outcomes, reinforce the need for multi-dimensional explanations. Is this relevant to walling? The result of building a wall is not usually focussed on a performance for an audience. The result is not the

performance itself, but a wall. Some parallel might be found in walling competitions, although Griffiths' (1999) description does not indicate such, other than "a tidier result" (p.18).

Campbell (2001), in a cross-cultural study of musical skill acquisition, notes several commonalities or recurring themes:

...aural-oral techniques of demonstration and imitation; the visual-kinaesthetic network; the spectrum of holistic to analytical reception of skills and knowledge to be acquired; the necessity of eye-hand co-ordination and the perception of gestural patterns for instrumentalists; and the role of the expert (from a master of the tradition to a peer whose knowledge is only slightly greater than the learner) (p.225).

This echoes the need for a mentor in the arena of sport. Is there something here about the relationship between teacher, or coach, or mentor and a student that can be applied in dry stone walling?

McPherson (2005) argues that conceptions based on the amount of practice undertaken are inadequate to understanding the early stages of instrumental development, and that a more coherent explanation of learning comes from understanding what children are thinking as they process music visually and aurally. He concludes that very little research is currently available that clarifies what are appropriate strategies of learning, how they are used, when, where and why. In summary, practice is important but not sufficient. This has a parallel in dry stone walling.

2.6.4 Medical and Surgical Skills

Surgical skills are clearly important to all of us: the difference between life and death can depend on them. These skills are a combination of knowledge, and its use in accuracy and speed, amongst others.

Booth *et al* (1995) compared the training of doctors in hospitals with teachers in schools: they found apprenticeship training and its relation to the acquisition of knowledge and skills an important element in the training process:

Quite often the learning is how to perform, how to make a judgement, how to select the right technical skill, how to communicate effectively and appropriately (p.158).

Hamdorf and Hall (2000) compared different models of learning, specifically pointing up the difference between an apprenticeship and a structured programme of learning. It appears that only recently has there been the beginning of a structured approach. Apprenticeship is alive and well in this arena.

Malin *et al* (2002) studied the use of 'rules of thumb' in general practice. They found the use of many rules of thumb, 'the rules that you carry with yourself', a type of immediate knowledge, which was not really conscious, but tacit. These rules were passed on usually by word of mouth, and the users needed to be clinically experienced before they could identify or use them. Clearly there is relevance to this work.

2.6.5 Educational Expertise

What is educational expertise? The question may be reframed as: how is educational performance (how) different from the academic (what)? Both are important. This brings us back to the difficulties in applying educational policy described in Section 1.3. and will be demonstrated in the results of this study: walling is not just a simple 'skill', but entails deep understanding.

Blackmore (2000) states:

There is not, nor will ever be, an accurate and objective means of measuring academic or any other expertise....Academic expertise is increasingly difficult to map, whatever the tool chosen (p.45).

Berliner (2001) attempts to do just this. In reviewing the research on expertise, he finds a problem in determining the relative roles of talent, deliberate practice, and context, but is able to describe a model of expertise acquisition based on the model of Dreyfus and Dreyfus (1986). He underscores the importance of fluidity in adapting to new situations, and flexibility in dealing with new problems. This does accord with walling in practice (see results section, especially Chapters 10 and 11).

Weinert *et al* (1990) assert:

Many recent studies addressing the expert-novice paradigm have impressively demonstrated that superior performance of experts is determined not so much by general aptitudes as it is by availability of content-specific knowledge. It has also been shown that not merely the amount of knowledge is decisive, but the quality of its mental representation, characterized by hierarchical organization and easy accessibility (p.165).

The authors conclude that instructional expertise requires a number of different competencies – expert knowledge in various forms (knowing what to do), an ability to build up knowledge-based situative models concerning the course of instruction (knowing how to do it) and executive instructional skills (knowing how to cope with changing or challenging situations). They specifically exclude the 'affective environment', but acknowledge its possible importance. Some of these themes on expertise may be relevant to dry stone walling, but whether knowledge and its accessibility is key is still questionable. Complexities of understanding and explaining how our brains and bodies operate still mean we have a long way to go for a proper understanding of the complexities of the learning process.

Lester (1995), in an echo of Schön's work, argues for a new paradigm for learning where:

...learning as a process parallel to, and embedded in practice and where the traditional distinction between working and learning is transcended and continuous (p.44).

Tynjälä *et al* (1997), in a wide ranging review of acquisition of expertise from an educational point of view, describe the trends in expertise studies and offer a useful view of how ideas of expertise are changing and how longitudinal studies of developing expertise are needed. Beijaard and De Vries (1997) suggest that expertise is based on cumulative experiences which are based on personal

motives, depending on the need to solve problems, or 'feelings of dissatisfaction'. Again, this echoes Polanyi's concept of 'passion for learning'.

Wade (1998) begins to address the issue of teaching expertise drawing on a whole range of resources, and begins to underline the difference between 'expert' and 'teacher'. He reiterates the work of Brown and McIntyre (1993) on the elusiveness of the concept, and states:

The more skilled the teaching is, the more difficult it is to understand how success is being achieved (Wade, 1998, p.99).

This underscores the importance of 'tacit knowledge'. He concludes:

What remains evident is that teaching is a complex interactive activity involving social practice together with moral purpose and intentions (ibid. p.100).

Kreber (2003) compared an 'expert' group of academics' views on scholarship with those of a group of 'regular academics'. She found that (not surprisingly) the expert academics focussed on peer review and 'scholarly standards'. The 'regular academics' focussed on 'good' or 'effective teaching'. What is of interest here is the ongoing issue of difference between 'knowing what' and 'knowing how'.

2.6.6 Psychological Expertise

Gardner (1993), in his influential text, refers to intelligences, domains, and fields. Intelligences are human intellectual proclivities. Human beings are born into cultures that house a large number of domains - disciplines, crafts and other

pursuits - in which one can become 'enculturated', and then be assessed in terms of the level of competence one has obtained. Once one achieves a certain competence, the 'field' becomes very important. This 'field' is a sociological construct which includes people, institutions and mechanisms that render judgments about the qualities of individual performances. Gardner's hierarchy resembles Hoffman *et al's* (1997) "complex and dynamic nestings of actions, and social situations" (p.574). Gardner's approach to intelligence comments upon the narrow way in which we, in general, view intelligence, and value the way in which it is narrowly measured. Whether Gardner's reformulation helps is questionable. However, there is a current relevance to recognising the complexity of measuring human abilities.

Goleman's (1995) work on Emotional Intelligence, the basic theme of which developed Gardner's work, describes five domains of emotional intelligence – knowing one's emotions, managing emotions, motivating oneself, recognising emotions in others and handling relationships. Goleman introduces the concept of 'flow' as:

Being able to enter flow is emotional intelligence at its best... flow is an experience almost everyone enters from time to time, particularly when performing at their peak, or stretching beyond their former limits... entry to this zone can occur when people find a task they are skilled at, and engage in it at a level that slightly taxes their ability, people perform at their peak while in flow, they are unconcerned with how they are doing, with thoughts of success or failure, the sheer pleasure of the act itself is what motivates them (p.90).

People in 'flow' often make the difficult look easy. Most interestingly:

Flow poses a neural paradox: we can be engaged in an exceptionally demanding task, and yet our brain is operating with a minimal level of activity or expenditure of energy. The reason seems to be that when we are bored and apathetic, or frenzied with activity, our brain activity is diffused. The brain itself is at a high level of activation, albeit poorly focused, with brain cells firing in far-flung and irrelevant ways. But during flow, the brain appears efficient and precise in its pattern of firing (ibid. p107).

Flow is important to us in this study as it makes links in the complexity of emotion, brain function, physical activity, and motivation. Is this what we see in wallers?

Pinker (2002) suggests that new material about genetics, biology and neuroscience allows us to describe a current picture of human nature which:

Is rich enough to take on the demands of seeing, moving, planning, talking, staying alive, making sense of the environment, and negotiating the world of other people (p.100) .

Psychological expertise is clearly a contested arena. Complexity is well evidenced.

2.6.7 Expertise in Dry Stone Walling

It may be thought that the literature on dry stone walling would be a rich source of material for this study. However, the written literature on dry stone walling is limited. Literature on learning and acquiring expertise in this field is almost non-existent, but a few writings contain some very relevant and important ideas.

The idea of a hierarchy of development of abilities is clearly demonstrated in the summary text from the 'Dry Stone Walling Association' (2006) - The 'Craftsman Certification Scheme' notes that candidates are strongly recommended to have

attained previous other certificates and to demonstrate a “higher standard of finish” (p.10) and that there is a need to demonstrate “using a range of different materials, building a range of features, the ability to produce quality work at the prescribed work rate and the ability to build to a high standard of craftsmanship in a commercial situation” (*ibid.*). There is no description of what the high standards are, or how they are understood. These only become apparent in the field, in talking to other wallers and by actually undergoing a test to see if you can reach the standard.

There are few texts describing the skill itself; ‘Dry Stone Walling’ (Rainsford – Hannay,1957) is still known as the classic text. Starting with a short history, he notes how in Neolithic times, walls were held together by the weight and accurate fitting of stone that they used:

Dry stone dykers, even when only moderately skilled, get much satisfaction with every movement they make. They are dealing with a separate problem with every stone they handle. If we look at a dry stone wall, we can see the countless little problems that had to be solved with every stone. In this way the craft is a long way of ahead of any other practised out of doors. Stand and watch a skilled man building such a wall. Aimlessly, it would seem, he picks up a stone for the double dyke, but with no hesitation he finds a place for it, a place where it breaks joint, where it finds a firm bed and where it supports its neighbours (p.31).

Here we find early references to recognising the importance of weight, the complexity of the process, constant problem-solving, a reference to ‘finding the right place’, ‘crossing the joints’ and ‘placing the stone rightly’. Rainsford-Hannay (1957) also lists the merits and drawbacks of walls. This classic list still stands the test of time (See Appendix 2).

In an earlier text, Raistrick (1946) has some pithy descriptions of those who build walls: 'A man who shovels his fillings is no waller' (p18). This summarises something about the quality of the person and the crucial importance of fillings or 'heartings'. Here is a description of a waller from around 1820:

He is in general a blunt, manly, taciturn fellow, His employment is less purely mechanical than many others, he is not like a man ceaselessly engaged in pointing needles, or fashioning pin-heads. On the contrary every stone he lays or hews demands the exercise of a certain amount of judgement for itself; and so he cannot wholly suffer his mind to fall asleep over his work. Accustomed to ascertain the straightness of a line at a glance, and to cast his eye along plane walls in order to determine the rectitude of the masonry, he acquires a sort of mathematical precision in determining the true bearings and positions of objects. The mason is always a silent man; the strain of his respiration is too great, when he is actively employed, to leave the necessary freedom to the organ of speech (ibid. p.26).

Again, a masterly summary of walling and its practice: walling demands constant decision-making. It means you cannot automate its practice. The centrality of 'the straight line' is emphasised, as is the necessary physical nature of the work.

There are many 'Coffee Table' books (for example Baxter, 1989; Muir and Colbeck, 1992) which illustrate the harmony of walls in their environment.

Griffiths (1999), in his study of walling describes the quality of a good wall thus:

When I compared this wall with others, I noted that this looked 'tidier'. I couldn't express this at the time in any other way (p.13).

He also refers to walls being "tidier and tighter than others" (p.87). This appearance of 'tidiness' can be contrasted with Gardner's (2001) view of work in progress:

When you look at the first few feet of completed wall, it almost never looks right. But do not let this put you off. I get this same feeling. It will look better as you progress (p.115).

Not only is there an importance to the appearance of what is done, but also and a constant assessment of work in progress, and reflection on what has been done.

Some texts focus on the artistic aspects of walling (Goldsworthy, 2000; Snow, 2001) and there are a small number of history and geography texts (Allport, 1990; Murray-Wooley and Raitz, 1992). There are also a number of guides or manuals (Vivian, 1976; McRaven, 1997; Brooks and Adcock, 1999) in the 'how-to-do-it' or 'do-it-yourself' style. Few of these expound ways of 'how the skill is learnt'. This lack tells us, if anything, that there is something that might be gained by directly talking to the participants. There are amongst the literature, however, some important truths about the skill, and the people who practise it. The Reverend Samuel Smith of Borgue, quoted in Rainsford-Hannay (1957), who compiled most of the survey of Galloway in the early eighteenth century, states:

There is no operation connected with agriculture where so much depends on the honesty and integrity of the workmen (p.48).

Snow (2001), an experienced artisan, describes placing a stone:

When now and again a stone falls into a place that is utterly inevitable, I feel I am standing under a shower of grace. If I'm lucky, it happens a lot. Then again, some days it doesn't happen at all (p.6).

Snow begins to build a picture of some of the deeper processes involved in the craft:

A moral issue arises when I contemplate using the stone from an old wall for the construction of a new one. Wallers are a practical bunch. If those who built what remains of the old wall being disassembled could speak through time, they would probably say 'use it where you need it' (ibid. p.17).

This picture of the process continues:

When I start building, I don't set out to make a beautiful wall. My intention is a lasting structure. Throughout the day, I apply my efforts to the basic principles of dry stone construction. If I follow them successfully, I'm likely to leave behind a pretty good-looking wall (ibid. p.29).

Snow (2001) sets out his four principles for knowing why one stone and not another is needed thus – “End in, end out; cross the joints; keep the middle full, and taper as you go up” (p.32) (see Appendix 3). He also emphasises the importance of the waller's body as ‘the one irreplaceable tool a waller has’ (ibid. p.49). In his work:

I have two choices when walling: finding a stone to fit a space, or finding a space to fit a stone. Both are ongoing options (ibid.p.83).

This demonstrates an ease of work and a comfortable stance in relation to practice. He continues:

Stone is picked and placed: no exchanges, no returns, and no regrets. Giving each stone a second chance to find its home doubles the building time. Three chances make a job three times as long as it needs to. The first stone you decide to use may not be the best of the three, but as long as it is structurally acceptable, it stays. The place to make improvements over a potential mistake is made by recognising faults and using the knowledge of them to make the next choice a better one (ibid. p.84).

Here again we find a mass of knowledge and experience summarised - balancing time with quality, the relationship between the waller and his material,

describing successful 'learning by ones mistakes', and a form of reflection-in-action. Snow finally suggests:

Every wall can tell a story about its maker once we understand the language a stone speaks. Every stone is visible proof of the builder's degree of contentment. A stone that looks satisfied with its position reflects the sense of ease the waller felt when placing it there. I began this book intending to tell a story about my walls. The truth is, these walls tell a story about me (ibid. p.100).

Snow's insights into the craft, and the reflexive and complementary nature of the relationship between the waller and the wall are acutely described. Similarly to Snow's principles, but on a more practical note, Gardner (2001) describes "five techniques to help manage the work, and some old timer's principles" (p.110) (see Appendix 3). In contrast to Snow's expert comfortable stance with the flow of work, he suggests "pick the stone for the spot, not the spot for the stone" (*ibid.*). A further reading of this shows that Gardner is actually telling us to 'work from the wall to the stone, not the other way round' and is talking of an early stage in learning walling, when:

Beginning builders develop an appreciation for well-shaped stones almost immediately, and whilst this is a good thing, it also beckons to inefficiency... you'll wear yourself out by unnecessary lugging, and working from pile to wall will dispose of the best material you have too quickly (ibid. p.111).

Shadmon (1989) lists 'twenty things to remember' when building a wall (see Appendix 3). There are lists, both short and long, about what is necessary to build a wall. The guidebooks are examples of long lists of what to do. It would appear that as you learn walling and become more expert, more in tune with the

material and the job, the less need there is to use long explanations to express things, and no need to have long lists of 'things to remember'. How does this actually work in practice? What 'goes on' as you learn? There are many layers of understanding to unravel here.

2.6.8 Apprenticeship and Craft Skills

Lave and Wenger (1991) use accounts of apprenticeship to argue that most accounts of learning have ignored its "quintessentially social character" (p.1). They suggest that learning takes place in a participation framework, not in an individual mind. They locate learning: "not in the acquisition of structure, but in the increased access of learners to participating roles in expert performances" (*ibid.* p.17). They suggest a complex model of learning thus:

The concept of legitimate peripheral participation obtains its meaning, not in a concise definition of its boundaries, but in its multiple theoretically generative interconnections with persons, activities, knowing, and world (ibid. p.121).

After exploring the nature of 'situated learning', they develop their concept of 'legitimate peripheral participation', describing it as: "the negotiated character of meaning, and about the concerned (engaged, dilemma-driven) nature of learning for the people involved" (*ibid.* p.33). This gives another way of looking at learning:

Thus we have begun to analyse the changing forms of participation and identity of persons who engage in sustained participation in a community of practice... [in situations of apprenticeships]. The community of practice encompasses apprentices, young masters with apprentices, and masters some of whose apprentices have become masters (ibid. p.56).

They use several examples of apprenticeships – those of midwives, tailors, quartermasters, butchers and non-drinking alcoholics to demonstrate these ideas, and to widen the application of the idea of apprenticeship. They conclude:

Learning itself is an improvised practice: A learning curriculum unfolds in opportunities for engagement in practice. It is not specified as a set of dictates for proper practice (ibid. p.93).

They underline the difference between the “...use and exchange values of learning...” (ibid. p.112). They finally suggest that their concept:

... provides a way to engage in the practice-theory project that insists on participation in the lived-in world as a key unit of analysis in a theory of social practice (which involves learning) (ibid. p.121).

All this strikes some chords with our data, for example, that of a community of practice which involves many different sorts of people, and also “implies the *replacement* of old timers” (ibid. p.57); we all change with time. However, our data is not easily susceptible to such a long-term analysis, having been gathered over several, but not many years. We might consider the data as a ‘special case’ of a longer period of study.

Hanks (1991), following a similar line of argument, points out that:

The apprentice’s ability to understand the master’s performance depends not on their possessing the same representation of it, or of the objects it entails, but rather on their engaging in the performance in congruent ways (p.21).

This gives emphasis to the idea that learning is in the ‘doing of it’.

Ley (1995), in a very practical approach to the traditional crafts of ‘thatching and cob’ (mud walled houses), notes that despite the disadvantages of combustibility

and decomposition, 'the interest in maintaining thatch is certainly not dwindling'

(p.4). He suggests:

For historic, architectural, cultural and tourist reasons, [such] buildings should be retained and maintained (p.11) and ... more government incentives would be nice... to keep alive the rural crafts [which are] so important to the character and culture of the West Country (ibid. p.4).

There is no argument here about practicality or usefulness other than a passing reference to 'green materials' and sustainability. This contrasts clearly with Rainsford-Hannay's (1957) analysis of the usefulness of walls (see Appendix 2).

Wolek (1999) writing on metal-smithing, following Schön (1987), finds that 'apprenticeship' has a 'tacit core' which makes it difficult to derive generic educational principles from it. He focuses on the nature of 'internal knowledge:

The tacit feel for the interaction of different metals with body and tool movement as metal pieces take on shape, finish, and attractiveness of form (p.96).

He then uses the widest of examples from the Japanese tea ceremony, to traditional crafts and strategic thinking to argue that there is a need to clarify the meaning of the skilful development process. He suggests there are both operational implications (the teacher as expert – the need to focus on process) and theoretical implications (adult learning as shared effort – the current importance of the 'learning organisation'). Although there is nothing inherently new in these ideas, the breadth of this writing and its coherence around the two central themes of internal knowledge and skilful process, make it a relevant summary.

Gamble (2001), following Polanyi and Bernstein, using cabinet making as an example of apprenticeship, says: “tacit pedagogic transmission constitutes the essence of apprenticeship” (p.197). He uses Polanyi’s work to suggest why: “Those who have mastered the craft speak in drawings rather than in words” (*ibid.* p.197).

Delamont and Atkinson (2001) use the example of doctoral students in the laboratory to demonstrate the learning process. They focus on the teaching situation – first, undergraduates experience success because they are participating in stage-managed experiments. However, later in their careers, they have to learn that everyday research in the field or in the laboratory does not necessarily produce stable, useable results until they have mastered tacit craft skills. In turn they then learn to remove all mention of those tacit indeterminate aspects from public accounts of their research. Here we see Polanyi’s work of 1958 restated nearly half a century later within the field of the social sciences.

Barber (2003), following Polanyi and Schön, studied two groups of car mechanics and demonstrated that:

Repetitive learning processes, the need to reflect on the theory of a problem when there was no understood solution, and come up with a solution (pp.136-137).

In addition, where problem-solving was necessary:

Neither the other mechanic nor myself could adequately describe all the steps we went through in the defining of the underlying problem. Somehow that knowledge just seemed to be embedded there through years of experience (ibid. p.140, my emphasis).

Clearly, learning is not a simple process. Even in the arena of the craft of car mechanics, there is evidence of the use of tacit knowledge. McEachren (2004) explains the view of Kurt Hahn, the founder of 'Outward Bound' studies, on the importance of crafts:

Fulfilling basic needs by making items is a fundamental experience that both individuals and cultures have used to define, to distinguish, and to provide meaning for themselves as human (p.148).

And:

...the value of craftsmanship is derived from the total atmosphere of learning a craft, and that to make and complete a craft requires actions that demonstrate a balancing of many skills (ibid.p.145).

This holistic view underlines some aspects of dry stone walling.

Section 2.7 The Theoretical Framework for this Study

This review of the literature on expertise and learning, with examples from many different domains, brings a theoretical underpinning to this study. As summarised in Section 1.6, this study poses three main questions:

What happens when dry stone wallers are learning their craft?
How do they acquire expertise in dry stone walling?
How is this learning communicated?

It was also suggested that although many accounts of dry stone walling are romanticised and simplistic, this is only a small part of the picture. Experts may make the process of building a wall appear simple, but the reality is much more complex. The literature adds to the understanding of this complexity. In particular, a number of themes relevant to this study have emerged:

1. Knowing how and 'know-how'

Polanyi's theoretical approach (1958, 1983) stresses tacit knowledge and the importance of 'knowing how', compared with 'knowing that'. Indeed, his whole work is based on this argument. Dreyfus (1972) and Benner (1984) also stress the importance of 'knowing how', and have put forward a series of stages of learning, from novice to expert. General studies in expertise refer many times to expertise as 'know-how' in many contexts. From studies of apprenticeship and crafts, we find stresses on the idea of participation and apprenticeship, and a focus on 'the process of doing' and of tacit knowledge. Waks (2001) also emphasises Schön's approach to 'learning by doing'. Sloboda *et al* (1996), Drake and Palmer (2000) and Williams and Hodges (2004) all emphasise that deliberate practice is important for expertise to accumulate.

2. The use of tacit knowledge or intuition

Polanyi's (1958) theoretical approach also stresses tacit knowledge as well as the importance of 'knowing how'. His idea that skilful performance depends on unknown rules is a direct expression of tacit knowledge in action. Eraut (2000) also underlines the importance of trying to make tacit knowledge explicit. Dreyfus's (1972) and Benner's (1984) stages of learning, from novice to expert, also emphasise the use of intuition and emotion, especially at the 'expert' level. Rolfe (1997a) develops these ideas, particularly concerning intuition and reflection. English (1993), although critical of these 'stages of learning', does not discount the idea of intuition being involved in expertise.

3. Flow

Dreyfus (1972) and Benner (1984) refer to the importance of the state of 'flow', where a practitioner becomes totally engaged in their occupation. Schön (1983, 1987) emphasises the essential nature of 'reflection-in-action' in learning, and also adds to the picture of 'flow' in his ideas about 'facilitating learning by doing'. Goleman (1995), whilst emphasising the importance of emotion, describes in great detail the state of 'flow' in relation to maximising performance.

4. Constant decision making, reflection, and learning from mistakes

Schön (1983, 1987) emphasises the essential nature of 'reflection-in-action' in learning and also 'reflection-on-action'. Benner (1984) also focuses on the need for reflection. Rolfe (1997a) develops these ideas, particularly concerning intuition and reflection in the acquisition of expertise. Beijaard and De Vreis (1997) agree, stressing the importance of the need to solve problems by reflection, and the role of emotion.

5. Individual and subjective variations and experiences, individuals learn in different ways and over different periods of time

Several of the theoretical perspectives attempt to simplify learning into a series of 'stages', e.g. Dreyfus and Dreyfus (1986), Dreyfus (1992), and Benner (1984). Critics of Dreyfus and Benner (e.g. Hargreaves and Lane, 2001) have pointed out that these models do not easily fit the real world. Pinker (1997, 2002) and Rose (1992) make a persuasive case that complexity is in the essence of 'doing' and not easy to understand. From studies of learning in education, we find

recognition of the importance of many different influences, such as talent, deliberate practice, context, problem-solving, and adaptability. In studies of sport, Boyle and Ackerman (2004) point out large differences both within an individual as they learn, and between individuals. Latash (1996) points out that even in relatively simple skills, individual variation in learning and performance is important.

6. The relevance of emotion

Dreyfus (2002a) suggests that emotion is an integral part of acquiring expertise. Damasio (2000) also stresses the importance of emotion in the human experience. From studies of music, we find reminders of the importance of emotion, and a reference to the importance to practising at different times of the day. Goleman's work on 'Emotional Intelligence' (1995) gives a detailed description of 'flow' and how it can be a motivational factor in learning. Polanyi's (1958) theoretical approach stresses the need for an emotional commitment to learning along with the need for tacit knowledge and the importance of 'knowing how'.

7. The use of rules of thumb or maxims

Polanyi (1958) stresses tacit knowledge and the importance of 'knowing how', and a 'skilful performance depending on unknown rules'. However, he also points to the use of maxims, or 'rules of thumb' to communicate between experts. Dreyfus (2000a) agrees, referring to "authentic language only making sense to

experts” (p.368). Benner’s (1984) work supports this. From studies of learning surgery, (Malin *et al*, 2002) we find references to ‘rules of thumb’. From the literature on dry stone walling, there is reference to the existence of ‘rules of thumb’ or ‘maxims’.

The above seven themes suggest that learning and communicating expertise is likely to be a complicated process, which involves:

- ‘Knowing how’
- The use of tacit knowledge or intuition
- ‘Flow’
- Constant decision making, reflection and learning from mistakes
- Individual and subjective variations and experiences
- The relevance of emotion
- The use of ‘rules of thumb’ or maxims.

This review of the literature suggests that learning and communicating expertise in dry stone walling is likely to be a complex process. From all the many theories of learning examined, the above seven themes have been selected for their potential relevance to this study. Therefore they form the theoretical framework for the research that follows. These themes will be used to formulate the questions used in the interviews, and the participants’ responses will be analysed in relation to this framework in the concluding chapter of this study.

Chapter 3 Methodology

3.1 Introduction

In this section we will restate the aims of the research, the range of methods available which might be used to gain relevant information to meet these aims, and some of the real issues which affected the choice and development of the types of method used in this study.

3.2 Research Aims

The original aims set out at the start of this work were:

'To understand the nature of expertise in dry stone walling, how it is understood by those practising the craft, and how it is transmitted to others'. This has been focused by the use of three research questions:

- What happens when dry stone wallers are learning their craft?
- How do they acquire expertise in dry stone walling?
- How is this learning communicated?

Defining expertise has its difficulties, as we have seen. In addition, given the relatively small amount of literature on dry stone walling, the ability to gain enough relevant knowledge from these sources was not likely to produce enough material for a complete discussion of 'how wallers learn' . I was driven to the source of expertise – wallers themselves. This appeared to be the best source of information - spending time with people doing the job, and letting them tell the story of learning as they actually learnt, on the job. There are many other ways of

gaining related data, such as recording 'actions' in picture form, or on video, which might produce some related data ('what do wallers actually do when they are walling?'), but here we are concerned not about 'actions' but 'understanding', which must reside in those undertaking the task, both in those teaching it, and in those learning it.

3.3 Understanding and Interpretation

Learning more about how people themselves understand what they do, the nature of that 'knowing', how knowledge is gained, used and communicated or transmitted to others, clearly falls within the qualitative school of enquiry. The theories of Dreyfus, Polanyi, and Schön relate to human understanding and its nature, including that of knowledge of the actors' intentions. This perspective, of course, has its critics. From the broad perspective of Social Science, Cohen *et al* (2000) refer to Rex's (1974) suggestion that there is a need for a wider view than: "...social reality which is made available to us by participant actors" (Cohen *et al* 2000 p.26), and Bernstein's (1974) view that "Subjective reports are sometimes incomplete and they are sometimes misleading" (Cohen *et al* *ibid.* p.27). Cohen *et al* (2000) take this to be a major criticism – that:

The very process whereby one interprets and defines a situation is itself a product of the circumstances in which one is placed (ibid. p.27).

The situations that exist in doctor's surgeries or head teacher's studies, where the inequalities of power between participants mean that one party has the power

to impose their own definitions of the situation can lead to very limited or skewed interpretation of the whole situation:

The danger of interactive and interpretative approaches is their relative neglect of the power of external –structural – forces to shape behaviour and events (ibid. p.27).

Hamilton (1998) describes how the boundaries between qualitative and quantitative research became blurred in the 1970s, and 'sophisticated rationales for action or participatory research beginning to emerge' (p.125). Denzin and Lincoln (1998a) suggest:

Qualitative research is endlessly creative and interpretive. The researcher does not just leave the field with mountains of empirical materials and then easily write up his or her findings. Qualitative interpretations are constructed (p.29).

Punch (1998) argues forcibly for a "...get out and do it..." (p.157) approach, whilst counselling: "...not to be unduly naïve in this..." (*ibid.*). Guba and Lincoln (1998) refer to several competing paradigms in qualitative research, and attempt to demonstrate the different methodologies relating to the paradigms of positivism, postpositivism, and critical theory, which all stress the 'value determined' nature of inquiry. The point here is that the different methodologies relate specifically to the different paradigms. They note:

Except for positivism, all the paradigms discussed are all still in their formative stages; no final agreements have been reached even among their proponents about their definitions, meanings or implications (p.204).

Here we see that the general ground of qualitative research is still the subject of much debate. Janesick (1998) describes some of the risks involved in qualitative research by describing it as 'methodolatry':

The preoccupation with selecting and defending methods to the exclusion of the actual substance of the story being told (p.48).

However, in her metaphor for qualitative research as a dance, she underlines some of the more positive aspects of qualitative research:

Built into qualitative research design is a system of checks and balances that includes staying in a setting over time, and capturing and interpreting the meaning in individuals' lives. The qualitative researcher prefers to capture the lived experience of participants in order to understand their meaning perspectives. This is exactly the opposite of the quantitative approach, which prefers to aggregate numbers that are one or more steps from social reality (ibid. p.53).

Atkinson and Hammersley (1998) describe ethnography as having the following features:

- a strong emphasis on exploring the nature of particular social phenomena, rather than to test a particular hypothesis about them.
- a tendency to work primarily with 'unstructured' data, that is, data that have not been coded at the point of data collection in terms of a closed set of analytic categories
- Investigation of a small number of cases, perhaps just one case, in detail
- Analysis of data that involves explicit interpretation of the meanings and functions of human actions, the product of which mainly takes the form of verbal descriptions and explanations, with quantification and statistical analysis playing as subordinate role at most (p.110).

This research study is clearly, therefore, a form of ethnographic study.

Cohen *et al* (2000) attempt to list the distinguishing features of the alternatives to positivism:

- people are deliberate and creative in their actions, they act intentionally and make meanings in and through their activities
 - people actively construct their social world- they are not 'cultural dupes' or passive dolls of positivism
 - situations are fluid and changing rather than fixed or static; events and behaviour evolve over time and are richly affected by context- they are 'situated activities'
 - events and individuals are unique and largely non-generalisable
 - a view that the social world should be studied in its natural state, without the intervention of, or manipulation by, the researcher
 - fidelity to the phenomena being studied is fundamental
 - people interpret events, contexts, and situations, and act on the bases of those events
 - there are multiple interpretations of, and perspectives on, single events and situations
 - reality is multi-layered and complex
 - many events are not reducible to simplistic interpretation
 - we need to examine situations through the eyes of participants, rather than the researcher
- (pp.21-22).

Without attempting to ascribe one 'school of thought', or specific paradigm, to this study, the close 'fit' of the above criteria to our subject matter is obviously relevant.

How valid is this approach? Denzin and Lincoln (1998c) argue there is a need for authenticity and trustworthiness. Altheide and Johnson (1998) suggest four criteria of ethnographic quality: plausibility, credibility, relevance, and the importance of the topic. They continue:

Good ethnographies display tacit knowledge, the largely unarticulated, contextual understanding that is often manifested in nods, silences, humour, and nuances (p.297).

Flick (1998) suggests that three errors relating to validity may occur in this type of research:

- to see a relation or principle where they are not correct
- to reject them when they are indeed correct
- to ask the wrong questions.

So how is the link made between 'what is going on', and the researchers report of them? The questions were developed over a period of time, and changed according to what took place both in those interviews, and in the study of the relevant literature. By evidence of detailed recording, and detailed analysis of these recordings, this link is evidenced. Things would still look the same, even if this empirical research had not taken place.

Hammersley (1992) offers a view of "subtle realism" (p.50) on the position of validity, which Flick (1998) suggests means that:

The question of validity in qualitative research turns into the question of how far the researcher's constructions are grounded in the constructions of those whom he or she studied (p.225).

I would suggest that this is exactly where I started and finished.

3.4 Ethics

Cohen *et al* (2000) suggest there are several ethical aspects of qualitative naturalistic research, the first key question being that of informed consent. Initially (and latterly) there appeared no potential material which would be of harm to the participants or to the others if disclosed. I decided on the face of it that telling people in the most open way possible what I was attempting would be of greatest advantage. I was already in touch with many wallers in many contexts. To have attempted to do research without declaring myself would have

been nonsensical, and in practice, impossible. Fontana and Frey (1998) suggest that:

The techniques and tactics of interviewing are really ways of manipulating respondents while treating them as objects or numbers rather than individual human beings (p.71).

This is not the case in this study: each person with whom I recorded a conversation has an individual name, and was free to participate, or not. The results will be shared with the participants.

3.5 The Selection of the Method

In selecting relevant methods, a range of possibilities arise: Documents, Observations, Questionnaires, Interviews, Focus Groups, and many others.

The challenge was to find a way of eliciting information that was relevant. This obviously necessitated finding people who could give me that information – people who were practising building walls, or better still people who were teaching or learning walling. As ‘understanding’ is a key concept here, there was no other way to get at that understanding than directly by listening, asking questions, and trying to gain understanding by interacting with those who were doing the job. Talking to people and recording those talks became the preferred method of my enquiry.

Documents were in short supply. Texts on ‘understanding’, rather than ‘instruction books’ are virtually non-existent, but some authors provided pointers

to what might be important, for example: Rainsford-Hannay(1957), Raistrick (1946), Garner(1984), Gardner (2001), Snow (2001), and Shadmon (1996).

Observation as a key method of enquiry was not an appropriate method at the start of this work – how would these observations be able to be interpreted without some primary understanding of what the participants themselves understood?

Questionnaires appeared inappropriate for several reasons: what would be the questions? How would they be understood? Were there people willing to fill them in? - a common saying in the Dry Stone Walling Association is that 'there are wallers who talk about it, and there are those who do it'. Whether those who were prepared to talk about it would be the best ones to demonstrate the 'essence' of the craft seemed doubtful. I appeared to be a long way from getting even small amounts of material.

As a manager with a great deal of interviewing experience already, I was not deterred by the idea of semi-structured interviews. Indeed, I had been impressed over years about how detailed comments from respondents to questionnaires (the open field box for 'any other comments') often had yielded information which had been most useful in changing things. Open questions and answers provide rich material which gets at the real issues that respondents want to talk about. In addition, I had developed large group interview techniques over years of practice, so was confident in my abilities to get at what was necessary, *providing I was clear about what I wanted to get at* (my emphasis).

The importance (and potential usefulness) of using some sort of open-ended interview technique rested partly on my own skills in identifying relevant situations, in using them, and in the detailed recording of the conversations. My respondents knew me, and in general, knew I wanted to discover something about how they understood what they were doing. The nature of what I was after was essentially unquantifiable and difficult, if not impossible, to describe beforehand, or even during the conversation/interview process. The results emerged over time by study of the material, post-facto.

3.6 Recruiting Respondents

My own involvement in dry stone walling started by enrolling in a class in a local college (Craven College in Skipton) in 1998, which I have continued to the present day.

In order to get some official support for my research, I went to see the then DSWA chairman, who was very appreciative of my attempts to elucidate some patterns out of learning dry stone walling. He suggested I attend branch meetings of the Yorkshire Branch of the DSWA, which I did, along with visits to other branches in Lancashire and South Yorkshire. Having located branch meetings, the next hurdle was to publicise my research, to gain willing participants. How do you do this? Most of my audience were appreciative of my efforts, although each person's understanding of my work seemed different... it is truly said that:

Any of us who have done fieldwork know how critical initial interactions in the field are as a precursor to establishing trust and support
(Denzin and Lincoln, 1998b, p.40).

I joined the DSWA and maintained my attendance at two local branch meetings, a process not made any easier by the fact that one branch was recruiting well, and developing fast, and later became a branch in its own right. The process of breaking away and becoming a new branch took several years and was not without related difficulties. To this day there is still debate in the two local branches and national DSWA about joint projects, their funding, the uses to which the funding should be put, and how projects can be taken forward. I put an article in the 'Waller and Dyker' magazine (the official journal of the DSWA) at the same time, and received some correspondence from a waller in Dublin.

I visited DSWA events and spoke to people there (Honley show in 2000, for example) – the DSWA regularly attend agricultural shows with a 'publicity stand' or a demonstration of wall building.

I attended various training courses (in business development, geology, and setting up road signs) where I attempted to find people who would co-operate in talking about what they did and how they did it.

Talking about my research gained positive responses from those with a research bent, (e.g. is walling statistically over-subscribed to by left-handed people? Could modern management theories of learning be applied to walling?) But the majority of practitioners were more interested in the 'doing' than in the talking about it. Much of the business of DSWA branch meetings is taken up with necessary

bureaucracy (such as land ownership, insurance, and getting people and materials on to site at the right time). Discussions about walling itself usually take the form of an 'illustrated talk', exhibiting someone's particular interest or appreciation of a particular skilled individual's work. Clearly branch meetings would give me some information, but not the sort of knowledge I was interested in. I would have to engage with individuals or groups outside discussion groups, somehow involving the practice itself.

3.7 How to Talk to Wallers

At this point I had several positive offers from wallers who (in summary) said they would be happy to talk to me *whilst walling* (my emphasis). Essentially I had a small number of offers to join people in building walls either as a student or participant (or 'barrowing' i.e. fetching and carrying). Few of these offers came to fruition early for various practical reasons (e.g. lack of ability to find times when we were mutually available). One offer came to nothing when it was cancelled at the last minute (latterly I learnt that the work I had been offered to go see and join in with was at short notice being examined for a prestigious 'Pinnacle Award').

I was also a member of a 'walling class' at Craven College, which I had now been a member of for several years, the membership of which varied and changed each year, with some people leaving, some new members joining. The teacher, a master craftsman, supported my work.

3.8 Asking the Right Questions

I had a tentative set of questions to ask which were based on my research questions, and the themes that form the studies' theoretical framework. These related to whether there were implicit thinking and feeling processes and whether these could be made explicit, and some ideas about how 'master craftsmen' had knowledge that others did not have.

I first interviewed two people who were most positive about my research, Steven, my teacher, and Don (1), a long-time member of the West Yorkshire Branch of the DSWA. These two interviews took place in the respondents own homes in 2000. Although I had a set of key interview questions, the interviews began to take the shape of 'conversations', with the interviewees talking about the aspects of walling that interested them, interspersed with answering my questions about 'how they learnt things', 'who from', and 'when' (see Appendix 5 for an example). These provided detailed information which could be analysed afterwards, in relation to the seven themes.

3.9 The Interlude of Foot and Mouth Disease

The outbreak of foot and mouth disease in the UK in February 2001 brought my research to a sudden halt. Not only farmers, but all related activities were deeply affected:

The foot-and-mouth outbreak had serious consequences upon tourism -in both city and country -and other rural industries (The Royal Society 2002).

Professional wallers' incomes dropped dramatically. Places where amateur wallers could practice were severely curtailed. – my own class at Craven college was only saved from closure by arrangements being made for the class to take place on campus, rather than off campus. More directly, a mood of depression and gloom descended upon the walling fraternity. Branch meetings were consumed with communications about directives from The Department of Environment, Food, and Rural Affairs (DEFRA) and local stories of loss and more loss. There was no easy way to ask questions about people's thoughts and feelings in this atmosphere. This period lasted until November 2001, when most areas across the north of England were downgraded from 'infected' to 'high risk'. However, it was not until May 2002 when sheep and goats were able to be sold through store markets (DEFRA, 2002) although '20 day standstill' restrictions were kept in place. These standstill restrictions meant that if one set of animals had been moved in or out of an area, then another set of livestock could not be moved until there had been an interval of 20 days. These were only relaxed in March 2003 when they were replaced by a 6 day standstill order. This was relaxed in certain circumstances (e.g. for showing animals at agricultural shows) in May 2003. Thus some sort of normality was not really achieved until later in 2003.

DEFRA (2002) officially estimates that the rural economy lost between £2.4 and £2.9 billion in tourism losses as well as the direct costs of £3 billion.

Only after this period had been worked through and left behind was it possible to return to asking questions.

3.10 Finding Appropriate Recording Technology

Finding appropriate recording technology was another problem. I had a standard tape recorder – of an old style Dictaphone playback machine - which I tried out. I knew if I used fairly standard technology, then it would be likely that I would be able to get it transcribed relatively easily, if not inexpensively.

In the last few years, technology has moved on: new 'minidisk' recording machines are available. Laptop computers are now being developed with the capacity to record words and video. Is it possible to collect data in new and easier ways? I tried acquiring and testing minidisk machines. I discovered that minidisk machines of professional quality were available which would more than fulfil my needs. They were perfect in outdoor use, waterproof and frost proof, were used by BBC wildlife correspondents, and easily available at several thousands of pounds: practical necessities came back into the frame. Interestingly, most recent popular developments in sound technology have been mostly to do with listening to sound – and music, rather than the spoken voice – rather than recording it for later playback. Nothing has been developed for a mass market in this field.

Computer software developments in recording, in other ways than type, have been either through handwriting recognition or by voice recognition. Handwriting recognition has developed somewhat. However, voice recognition technology still has an enormous way to go before it can be used easily and accurately as 'old style' standard voice recording with someone typing up the resulting tape. The

person who types out tapes (or 'stenographer') has a crucial part to play in translating sound to type, as (s)he can automatically 'guess' some words from contextualisation. This is not possible by computers yet to any standard which is useful or convenient. Attempts to do this take up more time than is necessary and duplicates effort.

Are recorders available with the right capacity to record appropriately in outdoor situations (wind and rain) which meet the standard necessary? Again, the answer was not easy to find, most mass produced products being focused on listening rather than recording. Few companies seem interested in other than highly expensive 'recording studio' standards.

In the end, a very small local electronics shop worked with me to find the most appropriate technology, which was (and still is) a standard cassette tape player without a lapel-mounted directional microphone, (a directional microphone helps record the interviewer, but cuts out the responses from others). This machine worked well in all weathers except in pouring rain (when most communication is very limited anyway). Keeping the machine in my overalls breast pocket (where I normally keep either a tape measure or if necessary, a mobile phone) was convenient, and made for easy access when appropriate.

3.11 Emerging New Questions and Group Conversations

From 2003, as the emotional mood amongst the rural population, farmers and related occupations rose after 'foot and mouth', conversations about walling

restarted, and the trigger questions to elicit material for this research also developed. I began to try asking questions related to 'tacit knowledge'. The first two interviews had been very provisional, or 'pilot'. These interviews tended to follow what the respondents felt was important to them – their history, their way of learning, how important walling was to them and why. These early interviews took place in the respondent's own homes, and tended to be slightly formal. Clearly the respondents believed I was after some particular answers or pieces of knowledge, which were 'the right answers'. As this was not the case, this way of eliciting information was punctuated sometimes by uncomfortable silences and pauses, as either I or the respondent thought out what to say next.

Later, after more reading, three key questions began emerging as ways into what I was interested in: The first question related to understood knowledge in practice:

'How do you know when it's the right stone?' or
'How did you know that was the right stone?'

These two forms of the first question were used to elicit information relating to the themes of 'knowing how', tacit knowledge and decision-making.

The second question related to the respondent's own view of where they were in terms of practice and experience, in overall terms. The question also attempted to elicit whether the respondents perceived their learning in stages, with sudden insights and sharp changes in understanding, or whether their experience accumulated slowly and evenly, without particular or recognisable stages. This second question was formulated in terms such as:

'When did you know you could do it?' or
'How long ago was that?' or
'Did you realise all of a sudden?' or
'What do think of your walling now compared with when you started? Or 'How is your walling different now?'

This second question relates to the themes of decision making, reflection, and individual variations in learning.

The third question attempted to see if the respondents understood any particular things that 'had to be done' in the process. This question was simply phrased as:

'Are there rules to walling?' or
'Which rules do you use?' or
'What sort of rules?'

This third question related to the themes of emotion, and 'rules of thumb'.

As the interviews and my reading progressed, several other questions began to be relevant, relating to ideas about 'reflection' and 'flow': These tended to be phrased in ways such as;

'What do you think about when you are walling?'
'Do you have to concentrate on particular things?'
'Do you think about anything when you are walling?'

All these questions were supplemented by various general questions to help the flow of the questions, such as:

'Why do you enjoy doing this?'
'What is it that makes it interesting?'
'What is important to you about walling? Why do you do it?'

The later interviews, which took place whilst the interviewer and respondents were building a wall, were therefore punctuated by periods of activity, and

comments on those activities, which allowed other questions to be asked, such as: 'Why did you do that just then?' 'Was there a particular reason?'

Further developments of the questions kept being necessary: general queries about interest in walling changed to specific ones about what was particularly enjoyable, and why. The role of emotion in the process became more obvious as the questions developed. The nature of 'good days and bad days' emerged as a topic of conversation regularly.

The walling class I attended became very fertile ground for 'individual conversations' and 'group conversations', with the teacher interacting with a group of pupils, and conversations between myself and other students becoming a 'normal part' of the process, insofar as conversation is a normal part of the days work. The main material upon which this study is based came from a series of 15 sessions with a range of students in several different locations over 2004-2005. Each class had a different number of students, and from a range of backgrounds. One of them intended to go on to become a full time waller. Some wanted experience to 'do their own garden wall'. Some wanted a higher level of experience. Some 'just wanted to do it'. Few (except Walter and myself) remained during the whole 6 terms or three years. The main teacher was Stephen, but there were occasional visits from others, especially on the last site, which is now the national teaching site for the DSWA.

I attended several 'practice sessions' at a local branch of the DSWA, in order to test out the possibilities of taping conversations with wallers practising under

supervision from other teachers. The difficulties of doing this presented themselves swiftly: in order to be able to tape record talking to wallers, either they have to be confident in their own abilities (as a craftsman, or better still, a 'qualified trainer') or the person in charge of their group had to give sanction or permission. Many wallers are confident in their craft, but not used to talking to relative strangers, other than customers, which usually directs the sort of conversation towards things such as time, stone supply, costs and prices.

Few trainers need an extra task (of coping with someone who appears to be extraneous to the task in hand) when they are busy 'setting up' a new walling site, with all the attendant tasks of starting a new task, such as locating pins, lines, stone, and ensuring that students do not veer too far from the accepted practices, at the start of a job. As an example of this, I worked with a new group recently, where my role was one of 'experienced student' where my suggestions were accepted, but the overall direction of the project was with a teacher who was two fields' length away. The result – no taping, no topstones sorted, and a low quality piece of work which had to be rebuilt the following week. In order to elicit information, both interviewer and interviewee need to be comfortable and relaxed. In the case of walling, this means the roles need to be clear at the start before introducing new people and practices to the 'normal process'. The relationship between a trainer/teacher/craftsman and his students is a personal one, which has to be owned and understood by the superior, with the students taking their 'line' from him. Without the 'hands-on' approval of the teacher on site,

(even with the blessing of the National DSWA), then the process becomes blocked, stilted, and full of questions which need to be answered before the interview can continue, but for which there is no time or energy possible.

Thus I focused on my own class, where approval and support from the teacher was clear and unambiguous, and allowed us all to 'do the job' whilst talking about it. This began to provide a very detailed description of 'what was going on' in the class. The resulting data was collected in a series of tapes, which involve both individual and group conversations. Each interview or group conversation is cited as a numbered interview, with the individual participant at that time named. Thus '(Stephen, interview 10)' means a comment from Stephen some time during the tenth collective interview.

I found that it was necessary, in interviewing on tape, to involve myself with wallers, then 'take a break' for taping. When the purpose of the exercise was explained to people, they wanted to be involved, but the questions did not have simple straightforward answers, so were difficult ones to respond to directly.

3.12 More about Interpretation

The respondents very often used 'common phrases or sayings' whilst walling, and began to use them in conversations with myself. I was struck by their repeated nature. In addition, the laconic, or 'tersely summarised' nature of the tone of these conversations began to become a marked feature. The participants in these conversations were using shorthand, and the shorthand was also code – in that phrases were used many times over, but not necessarily with the same meaning each time. I became fascinated with this material, in that it provided a

rich source of understanding, but did not easily fit 'the rules' of understanding other than that which it reflected in that space and time.

I was a long way from 'structured interviews' and even further from 'questionnaires', but I had much rich material, the essence of which was an attempt to understand 'what was going on' in the process of learning. Much material appeared obvious. Perhaps there was something in the obvious nature of the material?

I read and reread the material. I analysed it in terms of the seven themes identified in my theoretical framework – although the themes appeared to cross and recross the territory without apparent clear or simple linear logical delineations. Some ideas began to form, based on the detailed interview records, and the work of Snow (2001). I had to start somewhere. I decided to start as if building a wall, which would at least be understandable to myself as a waller, and see where this took me. Even then, where to start (as with a wall) can be problematic. However, this pragmatic approach developed around several summarised headings or axioms, related to the actual process of dry stone walling, which emerged as summary statements, each of which was deceptively simple, and mostly, often-used within the material I had collected. Thus I started with 'footings' and went on to 'throughs' and 'tops' with other processes (e.g. 'do it to the line') intertwined with these. Other lines of summarised knowledge and experience emerged as I went (e.g. 'good days and bad days'). The whole material came to be described under 11 'maxims', with other subject matter

under five other headings, those of emotion, 'rules', learning from mistakes, the obvious and practical, and working together. Whether these provide a comprehensive summary of the material remained to be seen. This framework can only be said to have emerged as part of the detailed process of observing the interview material, and trying to make sense of it as wallers do, rather than being imposed from outside, as, for instance by setting up a particular hypothesis, such as 'do wallers exhibit stages of learning such as those propounded by Dreyfus'? One acknowledgement of their apparent 'validity' or accuracy is by the response I have had from the wallers themselves when I have recalled them. Often great amusement, sometimes delight, sometimes puzzlement, accompanies most responses to what are, for most, a real recognition of 'what they do'.

Thus it was decided that each 'maxim', or rule-of-thumb, would be described in a separate 'results' chapter, with further separate chapters on the other four headings, in order to emphasise the importance of the material. These findings will be left to 'speak for themselves' in the results chapters that follow, but an attempt will be made to relate them to the original research questions and the studies' original theoretical framework in the final chapter.

3.13 Summary

This is a piece of qualitative research, attempting to elicit understanding from the respondents, which can then be analysed.

The first interviews had started with a relatively blank page. The early interviews took place in the respondent's own homes, and tended to be slightly formal. There were no particular lines of enquiry, other than variations on: 'what is it about walling that interests you, and why?'

Later, three key questions began emerging as ways into what I was interested in. The first related to understood knowledge in practice: 'How do you know when it's the right stone?' The second question related to the respondents' view of their practice and experience, in overall terms. The question also attempted to elicit whether the respondents perceived their learning in stages, with sudden insights and sharp changes in understanding, or whether their experience accumulated slowly and evenly, without particular or recognisable stages. This question was formulated in terms such as: 'When did you know you could do it and why?' The third question attempted to see if the respondents understood any particular things that 'had to be done' in the process. This question was simply phrased as: 'Are there rules to walling?'

As the interviews and my reading progressed, several other questions began to be relevant, relating to ideas about 'reflection' and 'flow', conscious and unconscious processes, and the involvement of emotion.

The first two interviews were individual interviews which took place in June 2000 and April 2001. Because of the break in research due to foot-and mouth disease, the later interviews started in 2004. Most of these were recorded in the 'learning

situation' of a further education class supported by a local college. These were interviews or conversations of varying lengths, from an hour to two hours overall, which were recorded whilst the group were involved in building walls in various locations. The number of participants varied, depending on the attendance of the participants in the class. In total, these 17 interviews involved a total of 23 respondents of varying experience.

The questions asked changed over time, because of both the early responses to the interviews, and the introduction of other theoretical questions that emerged from the literature review. The form of the results, and the discussion of each of the axioms, emerged from the data itself.

Chapter 4 Results and Discussion

'Every wall you take down, there is always a different element' (Stephen, interview 9) and 'It's the willingness to learn, and not being frightened of trying things differently' (Stephen, interview 1) both accurately sum up some of the complexities of learning dry stone walling.

This series of chapters addresses issues from interview data collected from groups of wallers over a period of several years. The interviews were conducted, in the main, whilst walling was going on – literally, 'in the field'. These interviews, recorded over many weeks of walling, are more accurately described as 'recorded conversations'. Wallers love building walls. Polanyi (1958) refers to 'personal commitment', which seems to be accurately reflected here. Wallers talk best about what they do when they are 'doing it'. They will invite you come to build a wall with them and talk about what they do as they do it.

This is qualitative data, and whilst the results can be analysed by content analysis supported by computer software, the nature of the data itself has provided a way to develop emerging themes which arise from the material itself, rather than relying on more externally prescribed processes. As an example, there were, in the material, many references to what could be called 'maxims', or situational rules. Polanyi (1958) indicates the importance of these for communication between experts. In addition, despite the fact that many of the wallers involved understood what a rule was, in a very sophisticated way, they did not understand the way they learnt walling as using such 'situational rules',

preferring to describe the way they did things according to the way they found them. The knowledge that they have is implicit in what they do and therefore there was no particular categorised way of capturing the material, which provides rich information about learning and the processes involved in, for instance, answering the questions: "How do you learn practical things?" or "What is it you learnt today?" These themes emerged over time: what was learnt in earlier interviews (e.g. if you ask the question "what are the rules?" - don't expect a list of rules as an answer) was anticipated in later interviews. The study evolved as it went along. A transcript of a sample interview (or collective conversation) is attached at Appendix 5.

What emerged from the material were a number of themes, reflected by some 'often repeated phrases' or 'touchstones'. These might be described as 'maxims' or 'rules of thumb', but they are more accurately described as axioms - 'self-evident truths' (Concise Oxford Dictionary, 1964, p.81) - which are most often uttered in a laconic tone, repeated in conversations during the working day, as a way of communicating what is going on, describing a particular part of a wall, or a particular action, acting as a focus to conversations about the process of walling and learning how to do it better. The importance of these phrases, which crop up regularly, and which are at one level an apparently simple way of communicating understanding during the activity of walling, began to impress as relevant and important, both in the way they were expressed and in the way they were used. Some of these phrases are described as 'principles' in some writing (e.g. Snow, 2001), and in some 'instruction books' (Brooks and Adcock, 1999), more long-

winded versions are written as 'instructions'. The way these phrases were used by wallers were not 'instructions' – indeed, some wallers expressly refused to apply the word 'rule' to these sayings. They could be best described as 'points of reference'. They were used as ways of communicating, ways of checking understanding, ways of remembering, used by teacher and pupil alike, as ideas to think about, as important points to remember as you did what you had to do, as ways of describing what needed to be done, as points in conversations to help rethink where you were in the process. The way of communicating them was distinct, also: usually laconic, not instructional, sometimes amused or joking, always short phrases. These phrases presented themselves around 11 axioms or 'maxims'. Other related material is recorded in another five sections (emotion, rules and 'rules', learning from your mistakes, the obvious and the practical and working together).

Thus the following material is presented in the way wallers express themselves, and in the way you might, as a new recruit to walling, meet descriptions of 'the way things are done' or 'the right thing to do at the time' or 'this is what you do'. Finding a way of ordering this material meant attempting to decide what came first, what came next, and what came after that. However, as the learning expressed appeared to follow no particular order, this presented a problem. Learning does not follow a linear pattern. It is not about 'facts'. It is about 'what you do' and 'how you do it'. The learning expressed here is implicit, complex, interrelated, and cannot be expressed in a simple or hierarchical way. One way of presenting the material could follow from the logic of the wall building itself:

footings, or foundations first, then other things. The experience of the process of learning walling (and therefore which might perhaps tell us something of the things necessary to teaching as well) is complex and interactive.

As a demonstration of this, let us start our wall: any waller with some experience will tell you that the first thing to do when building a wall is not the footings, but sorting out the topstones – to ensure that there are enough of them to top the wall when you are finishing. If there are any throughstones, again these need separating out from the others, to ensure they are used appropriately. With a little consideration, this makes absolute sense and demonstrates the ‘joined up’ nature of thinking necessary. We will start, however, for the purposes of this writing, with the footings, or foundations.

Polanyi and Prosch (1975) described scientific method as one of involvement.

This is graphically demonstrated here. Earlier, Polanyi also refers to:

...the act of ‘personal knowing’ being one where relations between the parts and the whole, and the relation of meaning to what is meant is not made, but discovered (Polanyi, 1958, p.63).

This ‘discovery’ is deeply embedded in the learning described here. For example:

An individual stone is a solid object. Together, stones become a liquid medium and naturally flow into curved walls (Snow, 2001, p.79).

Chapter 5 'Get your Footings Right'

Walls often, not always, are built of courses (or continuous layers) of stone, the largest at the base, smaller ones higher up. "Big ones in the bottom" (Stewart, interview 4; Walter, interview 9); "Big stones at the bottom" (Walter, interview 3).

Footings are the largest stones and it is also practical to use the most misshapen stones, as this will make use of them in the best way possible, to secure a good foundation, not leave the stone unused and not make the waller expend unnecessary effort in reshaping them for another part of the wall later.

What is a misshapen stone? Possibly something like a perfect sphere (except with the honourable exception of boulder walls), or possibly something which has many small 'faces' rather than a few obvious flat 'faces'. Walling involves locating the face of any stone to determine which way it should be laid in the wall. Then it involves using that knowledge to ensure that the stone is laid properly.

This part of the process involves "Getting rid of the big ugly ones – or 'monsters'" (Tony, interview 8; Stewart, interview 3).

Getting them in the right place, 'to the line', may involve, for example, digging holes in the ground to ensure that any variation in height is evened out, and ensuring they are in line and 'to the line' is important - for reasons which will become apparent later on - otherwise you might hear – or even end up saying- "The bloody stones in the foundations aren't in line" (Walter, interview 11). If footings are not in line when they need to be, then effort will need to be put in to get them in line, and that effort needs to be now, before other stones are placed

on top of the footings. The emotion involved also reflects the importance of 'doing the right thing' – also alluded to by Rainsford-Hannay (1957). The implicit 'tacit' understanding, even at this early stage of building a wall, is huge: which bit of which footing needs to be in line with what? How do you achieve it? Why do things need to be built in line, or 'to the line'? Why big stones in the bottom? Why not higher up?

A wall with small stones at the bottom might work well, but we don't know unless we ask more questions: what's wrong with small stones in the bottom? – what's wrong with big stones being at the top? Does it matter if stones are left over or wasted? Does it help in practice if you have stones leftover, waste or in the way? Obviously not. This links to other axioms, for example, 'Use what you've got'.

Using the biggest stones in the footings is logical. They are heavier, more difficult to manoeuvre, and will provide the most stable foundation in most situations. Here again there are exceptions to this rule, most notably in North America – where regular freezing and melting of the ground necessitates an underfooting of small material.

Once these questions of 'use the big stones in the footings' have been dealt with, (for better or worse, to everyone's satisfaction for the time being), other issues start to come to the fore – what happens if you haven't got enough big stones?

Then you will hear comments such as:

Long ones, that's what it's all about, long ones, maybe a short one if it's firm, to bind it well in, if you take your hand off there, you can see it's held in there, that's not going to come off (Stephen, interview 3).

These tell us something about the need for strength and how what is necessary for strength has to be moderated by what is available:

If you haven't got throughs, then be prepared to overcompensate with fillings, so you've got the strength (Michael, interview 5).

With all the rules, the overriding thing is the strength (Stephen, interview 3).

Strength in this sense is a general idea that appears to underlie all other considerations – but again, this needs deconstructing to understand it – strength in what way for what purpose? A good wall will stand for many years, and in order to do this, has to be built so it does not fall over on one side, or spread, or 'belly out'. Crucially, it also has to be flexible, moving with the land it is built on. A wall can (and does) move many yards without falling over, if it is well-built. The nature of the material and wall's construction is geared to precisely this quality: the weight of the material means the wall 'settles' over time. The placing of stones touching each other and the proper placing of fillings means any movement tensions are shared equally between all the stones. The placing of the 'throughs' ensures the two sides of the wall are held together whilst any movement takes place. The nature of a dry stone wall to be flexible means land movement can be accommodated over long periods of time. Even relatively sudden impacts (such as road traffic) can be accommodated. Compare this with a cemented wall, which is initially very strong, but if it is subject to stress, once it cracks, has one weak point which deteriorates progressively over time.

Many other aspects of learning are involved here, but a clearly important point - if we are starting from the footings – is that the footings must be ‘fit for purpose’, strong enough in themselves to take weight of all the stone built above them, and ‘even’ or level enough to be built on top of. We will see that other rules of thumb or maxims come in to play as we continue with our wall:

In the footings they are like teeth, a long one, a shorter one, you can get away with that (Stephen, interview 3).

Look at this foundation here. You can't leave that in and rebuild it. But this is brilliant. You've got the long one in there. Yes, they've put a shorter one in and a long one there. Long ones, that's what it's all about. That's what it's about (Stephen, interview 3).

As Polanyi (1958) says:

The correct application of these maxims is part of the art which they govern (p.31).

If there are particular difficulties in getting footings in, such as tree roots which cannot be disturbed, then there are ways around this, as in: ‘Step it up round the tree roots’ (Walter, interview 8).

Footings should be built on firmly packed ground, so that they sit firmly but flexibly with the land: cemented footings, or footings placed on concrete or other solid base, as with cemented tops, are inflexible and will not flex with any ground movement. Conversely, footings that are moveable (a common test for footings is to walk on them when they are in place) are not fit for purpose either, as they do not form a firm foundation for the courses which will be built above.

The stones must touch each other, preferably at the face part of the stones, so that there are no obvious gaps when you view the wall from a distance. Because you are using the largest stones, however, there may be some gaps visible on the face. The reason the stones must touch is obvious – so there is no slippage as the wall settles – the wall will settle naturally, but any gaps will allow slippage – not a good foundation. The stones need to create a firm but flexible foundation for the next course. If gaps are left, then building the next course becomes difficult, if not impossible, because of the unstable foundation.

So what have we learnt so far? Already we have long stones, if at all possible, so that as the wall settles, it settles evenly and the two skins do not belly out or separate. We have big stones – if they are available. If there are not many available, they are used alternately with others. We have disposed of stone that cannot go in the wall elsewhere. We have, if possible, an even course of stone to build on. We have a connection to another important maxim, discussed in the next chapter – ‘end in, end out’ - otherwise we would end up with a ‘traced’ wall, (one where the stones are laid lengthways along the wall) which is not acceptable practice, as in time it will fall down. This is an axiom or ‘maxim’ which is essential to understanding what walls are about - it is about the start of the process and placing stones so that the rest of the process can be completed properly. This learning is essential if you are to build walls that will stand. Without this learning and understanding, nothing will work properly.

Emotion, complexity and the need to understand how one axiom links to other axioms becomes very apparent. The way wallers learn appears to reflect Polanyi's (1958) description of the acquisition of personal knowledge very accurately. Dreyfus' (1992) early stages of stages of learning and building up expertise and "learning rules for context-free elements" (p.xii) appear however, not to be reflected – walling very rarely takes place out of context and these axioms are not 'rules' in the ordinary sense.

In building a wall, a balance has to be struck, both in placing footings, and in other stages, between the time taken (you can take a stone out, knock some of it off with a hammer and put it back again to better fit), the type of stone (will it respond to a hammer or not?), the size of the stones (moving a monster that can only be moved with a crowbar takes a disproportionate amount of time and effort) and the overall effort expended – this is the start of effortful work. Spending too much time 'getting it right' will not allow you time to do other things later in the day. Do you want a perfect wall, or one that will do the job, within the time you have? Snow (2001) suggests:

Stone is picked and placed: no exchanges, no returns, and no regrets. Giving each stone a second chance to find its home doubles the building time. Three chances make a job three times as long as it needs to. The first stone you decide to use may not be the best of the three, but as long as it is structurally acceptable, it stays (p.84).

So we come already to the need for 'balance' between time, strength, and flexibility. This balancing or 'taking everything else into account' happens all the time. Polanyi's (1958) ideas about heuristics and making constant adjustments to

what you are doing, whilst understanding why, is the order of the day. There is no evidence of Dreyfus' or Benner's stages of learning, or of 'rules for context-free elements'.

Chapter 6 'End in End out'

This description of how you should align a stone when you put it on the wall occurs very early on in learning – and like other axioms, its importance is difficult to overstate – a stone needs to be placed so the longer dimension goes into the wall, not along the face of the wall. This gives weight towards the centre of the wall and strength to the wall, so that as it settles, it settles evenly, and the two skins do not separate:

End in, end out (Chris, interview 3).

End in end out so you've got your strength, when there aren't enough throughs (Stephen, interview 3).

In addition, of course, you have to place the stone – if it has a natural grain - so that the grain runs horizontally, rather than vertically. This is so the stone does not split and rain washes off the stone, rather than running into it. Here again, though, there are some exceptions, such as Scottish 'boulder walls', where the stone is extremely hard, and has little bedding. The necessity of getting a wall to sufficient height outweighs other considerations. The stones in a boulder wall are placed so the length of a stone helps build height. The third physical dimension that needs to be taken account of is finding the 'face' of the stone, and placing the stone so the face is near vertical on the outside line/skin of the wall. In practice, understanding and remembering that all these things need to be done at once is difficult enough to grasp, let alone actually succeed in doing, so early steps of learning where and how to place a stone are helped by trying to remember 'end in, end out' as you go along. Sometimes, we focus on the doing,

not the outcome, sometimes consciously, sometimes not. Reflecting on practice, by standing back as each course of stone is put on, shows where things have gone right and where they have not – if you know enough to recognise your mistakes, of course. So there is a process of doing, becoming engrossed, then standing back and trying to ‘take apart’ what you have done. Mistakes can – and are - made in a myriad of ways, for example, not getting ‘to the line’, or not finding the right natural face of the stone, or placing the stone the easy way round, lengthways along the wall. All this practice also depends on the sort of stone you are using.

The results of ‘getting it right’ can be observed by someone with knowledge:

You can do it with a line or you can do it by eye and they get similar results. But if you want it really flashy - the polish to finish - you need a line to get it absolutely perfect (Stephen, interview 11).

Snow (2001) recognizes this, and Polanyi (1958) describes this process as ‘connoisseurship’ (p.64). Many times we find that learning is hindered by unexpressed assumptions – of which we all have. Some, like the ‘jigsaw assumption’, is common in many new students. This is the idea that everything has to lock tightly into place as it is walled, both inside the wall and outside – so one spends much time fitting fillings into spaces inside the wall, or placing stones so they fit tightly next to each other, but do not fit neatly at the face, or have points where faces should be. Another common assumption is that every stone should be so perfectly matched to the ones next to it that you hammer every stone to very small size and take forever to do so.

Sometimes you end up with a course of stone matching very well, but going uphill at one place and downhill another, not running 'to the line' but up and down from it. What do you do in this situation? Fill in the gaps? Possibly, if the right stone is available. Or possibly, in putting on the next course, correct the courses to the line as you go. Much depends on the type of stone you are using – using a hammer on old limestone simply does not produce constructive results - after hitting just a few stones, this is a lesson well learnt. For example, old Yorkshire limestone cracks and breaks in a random way, often at the opposite end from the one you are hammering, depending on where rainwater has seeped into it over many years – there is no way of controlling this – you have to 'go with the grain' of what stone is available.

The practice of 'trace walling' a stone so it is laid lengthways along the wall is not usually applauded. In the standards set by the DSWA it is not acceptable practice. Yet in using certain types of stone, it is necessary – using Cotswold limestone, where each stone is shaped with a hammer, producing many fillings in the process, may necessitate 'tracing' some stones, because the overriding necessity with this soft stone is to get the 'best fit' at the face and to lay the stone so its bedding is slightly tilted forward to the face, so any rainwater falls off the face. The resulting wall will have stones very well worked, tightly touching, with extremely fine joints, extremely well packed and very stable. The stone does not lend itself to 'end in, end out' within a reasonable timeframe. So tracing may be acceptable in certain situations:

If a stone comes half way across the wall, you can get away with it
(Stephen, interview 3).

This has a certain obvious logic. If a stone, whichever way it is laid, comes halfway across the wall, it is weighted correctly and is as big as it can be at that height and position in the wall, so it is not 'walling out' stones at the other side of the wall, then it will suffice. If a stone goes more than half way across, and begins to touch the stones at the opposing side of the wall, then it begins to function as a throughstone in some way or another; the question arises as to whether this is appropriate at this point in the building process. In addition, if a stone is too big, and gets in the way of filling the wall properly, or makes it necessary to use smaller stones than are appropriate on the other side, then it is too big, and cannot be used. 'Getting away with it' applies to single stones, rather than many; walls built with many stones traced regularly may look attractive to the untrained eye, but a few years on the calendar may well tell a different story. In addition to 'end in, end out', stones need to be laid so that their top surface is level, to enable the next course to sit comfortably on top of them, without slipping off. Even then, there are disputable variations to this: having the top faces sloping slightly downwards towards the outer side of the wall encourages rainwater to flow off the wall, rather than into the wall.

So what have we learnt? This 'maxim' or axiom, as described by Polanyi (1958, p.31), is essential to understanding what walls are about. It is about the individual stones themselves, and the learning implied is an absolute necessity if you are to build walls that will stand. Without this understanding, nothing will work properly.

This axiom is sometimes used in conversation, sometimes as a repetitive chant repeated either to oneself, or to others, during the day's work.

This axiom takes time to understand and be assimilated and needs to be understood in association with many other aspects of practice, all of which have to be taken into account. Initially it is not easy to follow, because it is itself a summary of many aspects of an individual stone and how to place it correctly. It is complex. It is not a 'rule for context free elements' (as described by Dreyfus, 1992, p. xii). Snow (2001) notes this as a 'principle' for knowing why one stone is needed and not another:

In that way the wall's weight presses on the greatest surface area of each stone (p.32).

Chapter 7 'Get your Batter Right'

Interestingly, getting the 'batter' or slope or angle of the wall face correct did not crop up often in these conversations. Much activity went into the setting up of the pins or frames e.g.:

Keep an eye on that – you may have to alter that line. But every course you come to, you may have to pull it (the pin) out. So if you can, pull these (pins) this way a little bit to give yourself that width (Michael interview 4).

To get the right template for the slope of a wall, walls are built using walling pins (metal rods, usually several feet in length) and lines (string lines several yards long which have, as described in the BCTV handbook (Brooks and Adcock 1999, p.33) another sort of pins - 'bricklayers' pins' - at each end. Sometimes the walling pins are substituted by a 'batter frame' made of wood. Essentially this sets the template for the shape of the wall. Using walling pins gives more flexibility, as the above quotation suggests. What the waller is describing is using pins and lines to get a gap filled, but slightly altering the batter or slope of the wall as it rises. This is often necessary for several reasons: sometimes a walling pin cannot be driven in exactly where it needs to be, and as in the above quotation, where the walling pin has too much batter or slope, the resulting wall would be too narrow at the top. Sometimes there is no place to place a bricklayer's pin appropriately in the remaining wall which is being joined up to the new wall. Sometimes, when walling round a tree, for instance, there is a need to wall not in a straight line and either the job has to be done by 'rack o' the eye' or by altering the line at each stage.

The batter of the wall is important to understand and get right because it is another essential part of building a wall that will stand the test of time. A vertically-sided wall will not settle properly as stones may slip out of the face. Most vertically sided apparently dry stone walls (as in house walls) have a cement core. Again, though, there are exceptions to this: some walls built to keep sheep in or out often have steeper sides than those for cattle boundaries, and are built very near to, if not actually, vertical. Rainsford-Hannay (1957) notes that black-faced sheep need a 5'3" wall to keep them in (see Appendix 2 for this detail). The following is a description of batter:

This is the angle - front side vertical, back side like that (with a batter) because as it settles, it's going to do that. So over the years, it's going to have a little bit of room to settle before it comes over again (Stephen, interview 3).

This description of a retaining wall tells the usually accepted way of building it – the wall side which is into the banking should be steeper than the batter on the open side of the wall to ensure the wall is not pushed over by the bank it is retaining.

There are other reasons for getting the batter right – not only will settling be better, to give the strength and flexibility needed for a wall, but the amount of batter will determine how much stone is used. With any particular base width, a more vertical batter will use more stone than a more angled batter. In gapping, replacing an old wall, there will be some indication of the original wall batter. With a new wall, much thought needs to be given to the batter – partly because of the issue of the amount of stone necessary (not too much, what would we do

with what's left? Not too little, where would we get more stone from?), partly from ensuring the wall is in keeping with its neighbours:

The decisions are made by looking around, what the other fields in the area is like, as you do wall in contour. People will say that they must do this or that. There is no musts because this area is just one mass of moles... I am saying to you now there isn't any hard or fast rule so long as the contour of the ground is rolling (Stephen, interview 3).

This evidences Polanyi's (1958) view of 'assimilated knowledge' (p.31).

One of Snow's (2001) 'principles' relates to 'batter': 'batter directs pressure inward and centralises the weight of the wall' (p.32). Dreyfus (1972) would agree that this was evidence of expertise at its highest level.

Chapter 8 'One over Two, Two over One'

This axiom, describing how to lay stones in courses, along with the similar phrase 'cross your joints' describes another part of the process of how to place individual stones. This is not about particular stones, but 'how to do it' to ensure that there are no weak spots or vertical 'running' joints created in the wall which might allow or encourage the wall to fracture at a particular point. A different explanation of this phrase might be: 'as you build your wall, make sure there are no running joints'. However, this last implies standing back to see the joints, whereas just putting one over two, two over one, mechanically applied, should produce the same result, without the necessity of moving from where you are building. However, the following might apply:

In certain situations, you simply have to do different things, like one over two, two over one, it's a sort of rule, but if you've got to a certain point where you've got a certain stone that has got to go in, then you're not going to be repeating that particular rule the whole time, you're simply going to be getting on with it (Don (1), interview 2).

Thus applying one rule to the exclusion of all others means that you are going to make mistakes in other ways – and you are going to take far too much time to do what needs to be done. We must not forget, whilst we are putting 'one over two, two over one' that "the main rule is time" (Paul, interview 3).

Again, although this appears a simple self-evident statement, it conveys a massive amount of understanding. It cropped up in a conversation when I was asking about 'rules'. If you had all the time in the world, you could build a perfect wall. This idea is talked about regularly in the DSWA, related to discussions of

the craftsman scheme and how the abilities of a waller are assessed. The initial and intermediate DSWA standards relate to doing various tasks within certain time limits. Some argue that this focuses on time rather than the results. At master craftsman level the standard is measured partly by tasks within timescales and partly to tasks completed to a standard without timescales. There is a great overlap between practice and expertise: much practice means speedier results, but expertise involves tacit knowledge and emotion in the doing of the practice. Knowledge about time taken and the materials used, is also implicit in the DSWA standards: different sorts of stone bring with them different necessities. Old Yorkshire Dales limestone cannot be coursed. There is no way in which time and energy could be well spent in breaking stone to make it fit – it falls into random pieces when hit and there would be no walling stone left to build with. In addition, the random shape and the friability of the stone mean that although it has to be walled as near to courses as is possible (in order to use up the large stones earlier), the walling process, the related thinking processes, and the description of the process begins to change to ‘finding the stone which will best fit in the gap left between others’. This produces the needed result very effectively.

So what have we learnt? We have axioms and more axioms: having noted just four aspects of walling, we find that each one needs to be remembered alongside the others, both about individual stones and about processes, as you build your wall. All these relate closely together. It is tempting to try and think that rules or

even maxims or axioms might fit into some sort of hierarchy – like starting with taking your wall down, then thinking about your footings and so on. In some very practical ways this might make sense. However, in the doing and the learning, we find that all the different parts of learning interrelate in a complex way.

Consciously following individual rules 'to the letter' can (and does) get in the way of other learning. Early on in learning, trying to focus on and practice of one rule to the exclusion of others e.g. 'get your footings right' often gives you an unexpected result – for example, a row of footings on which it is extremely difficult to build the next course, or 'doing it to the line' all the time might use up all the small stone too early on in the process. This is a very good example of Polanyi's (1958) "focussing on the subsidiarities" (p.92).

Next, we realise that doing walling is not necessarily about just the conscious processes: even if you are completely conscious of the relevant maxims, 'doing it' does not come easily. In fact, as Dreyfus (2002a) points out, trying to hold all the conscious rules in one's head at one time can be counter-productive. Knowing 'what' does not equate to knowing 'how'. Learning is not about doing everything in a conscious way.

Trying to follow maxims in a conscious way can (and often does) get in the way of 'getting on with it'. Trade-offs about time taken and the standard needing to be achieved are constant.

At the level of educational policy, the ongoing debate about how to measure standards and quality is not easily resolved. Government support to developing walling (and therefore, wallers) tends towards explicitly expressed and 'easily transparent' rules. Inevitably for the DSWA this is a necessary part of the debate and has an impact. The result is an uncomfortable attempt to meet government policy demands, whilst recognising that craftsmanship and expertise cannot be totally measured this way. Qualifications from the DSWA certification scheme are now accredited by LANTRA (The Sector Skills Council for the Environmental and Land-based Sector) for an extra fee, although the value of this accreditation is not yet well understood by most wallers.

This is another of Snow's (2001) 'principles', which supports the idea that this maxim is a necessary one. There is also a reflection here of what Dreyfus (2002a) would describe as 'expertise' in the sense of an ability to perform to high standards regularly, producing an 'expert performance'. Polanyi (1958) refers to 'connosieurship' (p.54). However, in the data described here, there is no evidence of Dreyfus' (1972) and Benner's (1984) 'stages of learning'. Practitioners use this phrase at whatever stage of learning they are at, as a way to communicate, as a reminder, as a way to reflect. This indicates that 'stages of learning' are not as clearly defined as Dreyfus and Benner suggest.

Chapter 9 'To the Line, to the Line'

This phrase crops up constantly, like others, as a repeated phrase by the teacher or by the student. The phrase is easy to say, to use, and (apparently) easy to understand. A straight reading of this, as a 'practical rule', would be 'make sure that when you place a stone that its top is next to the line'.

Using a line, a string line which helps give a guide to where the wall should be built, is an essential part of building a wall. Anyone who builds walls regularly uses a line. It is possible to build 'by eye' (by 'rack o' the eye') without a line, but:

You can do it with a line or you can do it by eye and they get similar results. But if you want it really flashy - the polish to finish - you need a line to get it absolutely perfect (Stephen, interview 5).

However, understanding it *in practice* (my emphasis) means rather more than this: 'knowing that' is not 'knowing how'.

Many walls are built in straight lines, some are deliberately curved, some need to be built around obstacles. The easiest place to start learning is with a straight wall. A straight line is a guide to start to do this:

You may not be able to do that (put a line right through) because it is on a slight curve (Stephen, interview 3).

Walling 'to the line' is a task which needs concentration, whether the wall is coursed or not. If it is coursed, then 'to the line' means being accurate to a few millimetres. If the wall is not coursed (as with old limestone) then doing it so accurately is not going to be possible and the idea of 'to the line' takes on a

different meaning, which is about getting as near as you can to the line on average, whilst not walling above the line. It gets very difficult to see whether the line is relevant once you go above it, and the stone tends to push the line out or the walling gets muddled up with the line.

Walling 'to the line' is a very simple statement which also needs high regard along the line itself – otherwise the resulting wall has hollows or bulges along the length of the line – as every novice student, to their cost, will tell you. The variation of 'do it to the line when you get to the troughs', or 'do it to the line when you get to the tops' (Don (2), interview 11) might save time and energy, but can only be put properly into practice when the waller has enough ability to know when (s)he is able to 'shortcut', although it is another useful rule of thumb or maxim. This is a rule of thumb rather than an absolute rule, because:

With any stone, if you're working along and you are getting absolutely spot on to the line, you'll be wasting a lot of nice little flat stuff – and time. If you say, right that's where we want a through, that's where we want a through – you just get them level (Walter, interview 7).

Here a waller again describes the balancing act that is part of the process, constantly working out what is needed, and what is left over, and working out time taken against the quality of result needed.

This description works more easily if you are walling in a random fashion, rather than coursing, but again, this idea can only come to fruition when you have enough experience. Do we know what 'enough experience' is? This phrase also means many things to many wallers - it might mean subjectively and personally,

'when you know as much as I do' or 'when you have been walling as long as I have'. It also might mean 'when you have done a lot more walling' or again 'when you are able to understand and do this, then you have obviously enough experience'.

There is a particular need to consider 'to the line' when getting throughstones in. Throughstones hold the two sides of a wall together. The underside of a 'through' stone needs to be as horizontal as possible across the wall, so that it fulfils its function of holding the two sides of the wall together and does not have a tendency to slip on its base, thus bringing the wall down. 'Throughs' are key to the length of the life of a wall. Often when you see a fallen wall, you will see that the gap has stopped falling where there is a through stone still holding the wall together.

So when putting a 'through' in, it is necessary for both sides of the wall to be 'to the line' and for both lines to be at the same level. If two wallers are working together, they have to agree exactly the level to which they are building, in order to have a proper area where the 'through' can be placed. A common problem with 'throughs' is to find, after it is placed, that there is a space (so you can see daylight through the wall) underneath it. A 'through', like any other stone, has to be placed so it 'sits' properly on the ones beneath it and does not rock on its base. This is initially difficult to understand and to do, but like anything else in walling, with practice, it becomes easier to understand and to do. There is a related issue about the 'feel' of a throughstone and its place in the wall - the base

must sit horizontally and be stable and then the amount of stone protruding on each side of the wall must be right, which is commonly two inches, but this depends on local style and practice. Sometimes the protrusions mark ownership of the wall so are only on one side, sometimes 'throughs' are placed flush with the wall (although it is difficult to see the advantage to this over a period of time). The upper surface of the 'through' must be one which you are able to wall over, without creating vertical joints or other difficulties or anomalies, such as courses - if there are courses - which curve up over the 'through' and then get repeated in courses above that.

As you get near the top of a wall, as the stone begins to run out, you reach another stage of difficulty - where to finish? What height should the wall be? What 'finish' should there be to the top line? There is no simple answer:

That line on for the finished height could have to be altered depending on the stone you've got left (Michael, interview 3).

It is necessary to have a very even clear line of stone under the tops for very obvious reasons. You need a secure base to place your tops on, otherwise, like face stones, they do not 'sit' well and are unstable, they wobble and (depending on the style of topping) may either be unsuitable to place another topstone next to it – or unsuitable to place another topstone leaning on it.

Getting a line on for topping is well described in the handbooks (for example, Brooks and Adcock, 1999) and getting tops 'to the line' is another crucial final step in building a wall, partly for stability and strength, but partly for the aesthetics

– a well topped wall, where the tops are absolutely in line, is (in comparison to one not done so) a wall with a very obvious element which can be (and is) easily appreciated by many people, not just wallers. The appreciation of the difference is somehow very obvious.

The following tell other stories:

Keep an eye on that – you may have to alter that line. But every course you come to, you may have to pull it (the pin) out. So if you can, pull these (pins) this way a little bit to give yourself that width (Michael, interview 4).

Line on foundation, line on for first through, line on for second through, and even then that line on for the finished height could have to be altered depending on what stone you've got left. Every stone that comes off the wall must really go back on (Michael, interview 4).

This is a description of finishing a wall to the appropriate height, but ensuring that all the stone is used. It is another example of what is a seemingly obvious process, in almost shorthand, but expressing something which gets extremely complicated in the 'doing'. How is this to be expressed? Get your lines on at each stage, build your wall, but then *alter* your line, altering your plan for the wall, depending on what stone is left. This could be seen as an example of Schön's (1983) reflection-in-action at the expert level. In fact the person was not in any sense an 'expert', having done only a few days of walling.

At this stage, just under the tops, you can put on another course (or more) of stone, using up all that is left and then get your topstones on in line, by altering the angle of the topstones, or using different shaped tops to get them on in the right line.

Getting the tops 'to the line' is an art in itself. What is 'the right line'?

If this right hand side is lifted up to the height of the wall, that end is more or less to height (Michael, interview 5).

This reflects a view looking along a length of wall, assessing where a new wall head and the wall behind it should be rebuilt to, to match the remaining old wall to which it is being joined.

This next example, about building on old wall foundations, tells a story of how assessing the situation, then starting the job by putting in a line, again summarizes a mass of understanding, and is complex and interrelated:

We need to get the old wall out. We need to come out to the true width and get out all the stone that's in there to be able to go down to ground level. When we first started this, I didn't realise how far down it was. I'm saying now we need to get that out. [Gestures] Now I'm going to put a line on the front of there. Try and keep within the confines of the trench if you can. Work that way so you keep the edge of the trench intact. So I'm going to put a line through – that's going to be the true line if the face of the wall. This is the angle - front side vertical, back side like that (with a batter) because as it settles, it's going to do that. So over the years, it's going to have a little bit of room to settle before it comes over again (Stephen, interview 8).

A translation of this might be: 'We need to knock down and get rid of the old wall. The old wall is still there in the ground and we cannot build another wall without getting rid of it. We cannot build off the old footings because they are not in the right place and if we tried to build on them, then the new wall would slide off the old footings. So I'm going to ask you all to take out all the old footings, to where it needs to be, to this line, with batter (angle) where necessary (the batter at the back of the wall will need to be steeper than the batter on the road side of the wall) and in this way we can build a wall at the roadside which will last many

years (we need to make sure that the wall we build has angle and placement enough to withstand wear and tear from cars on the road passing by)'. Clearly the context is crucial, but implicit in this description.

So what have we learnt? Doing things 'to the line' operates during the whole process of building a wall, from the footings to the tops. It is not a straightforward 'rule' because it varies in its meaning with different stone and different situations. It may be very difficult to interpret depending on the sort of stone used – old limestone, for example, will not break down to pieces which are congenial to being close to a line. In these circumstances, the phrase 'to the line' approximates to a view about where a line might be. The same may be said of large footings, where it is difficult to get an even line of stone. At best the line is 'a guide line'.

The rule is used with different meanings, depending on which part of the wall you are working on (footings, throughstones, tops) and the level of expertise you have. If you have some experience, only using a line when and where necessary – footings, throughstones, tops - not at every course, becomes usual practice, as it saves time and, as we know already, time is of the essence.

Walling 'to the line' keeps the wall (and the waller) in appropriate shape, in the three physical dimensions (along the wall, up and down, in and out) and more, because as the wall grows in height and the line moves up, it tells you how high the wall can be built, because if the top gets too narrow, then each side starts

'walling out' the other and there is no space for fillings. Although this is at one level very obvious, in other ways it is not: none of these dimensions exists without its relationship to the others and more, to other dimensions - such as time. There are also implications for when two people are working together, one on each side of the wall. It is easier to use lines only where necessary – again, where 'throughs' are needed, or when topping.

Doing it successfully 'to the line' depends on doing many other things at the same time. The practice is clearly useful in supporting 'how to get a polished finish' – but is also a general guideline in remembering how to 'keep things in line'. It can be - and is - used in many different circumstances: in places where there is an absolute need to get courses in and level (as when there is need to place a throughstone), then efforts have to be made to find enough stone to ensure this is possible. To successfully place a 'through', being level, is practically absolute. The underside has to be as horizontal as possible, otherwise the 'through' will not be helpful in the construction and will contribute over time to the wall being unstable, because it will slip.

The use of Polanyi's (1958) 'maxims' are clearly demonstrated. If it is used as a 'rule' and blindly adhered to, then unexpected results happen, for example, in placing a through, placing the underside of the 'through' 'to the line' will almost inevitably create other difficulties, such as vertical joints, or a 'through' that it is impossible to wall over.

In concentrating on the end point or end-goal, this axiom is of help in achieving this. It is an excellent example of subsidiarity, in Polanyi's (1958) model. However, there is no evidence of a context-free rule as expounded by Dreyfus (1972) and Benner (1984), as a necessary first stage or 'novice' stage of learning. It is easy to suggest that this is because walling takes place 'in the field' - there is no classroom other than where the wall is - and therefore walling is an exception to the general theory - but Dreyfus (1972) and Benner (1984) maintain that learning by abstract rules is the first key stage in their stages of learning. Not only are there no early abstract rules here, but also we will see in Chapter 17 that wallers do not see rules as abstract. All is 'in the doing of it'. Schön's (1983) ideas are illustrated, but the hierarchy of student and teacher is not the stark 'expert teacher and novice student' he describes. This is from an expert:

It's planning your job so you've got enough stones. I must admit I didn't know whether I would have had enough (Stephen, interview 6).

Again, we will see later that learning is also the prerogative of the expert as well as the student. A high level of expertise is demonstrated very early on in learning, rather than at a particular level. 'Learnt intuition in action' is apparent.

Chapter 10 'The Right Stone'

The search for the right stone is celebrated in many different ways. Popularly – 'a good waller picks up a stone and never puts it down', or Gardner's (2001) 'old timers expressions', such as 'What you lift, you build', 'Don't pick up any stone that you don't lay in the wall', 'Handle each stone but once' and 'A hole for every stone, a stone for every hole' (see Appendix 3).

This is a commonly quoted phrase which has come to have some mystique, interpreted in many different ways, having many different meanings – for non-wallers, it conveys some magical or mystical skill which a waller has. For the practitioner, who daily struggles with the reality, it has different connotations, and different variations in the phrase occur, or added conditions appear: 'a good waller never picks up a stone and never puts it down' ('in the same place' or 'he just puts it down somewhere else').

So we have a mixture of 'the right stone' and 'good waller' – which is it?

What we have here are different descriptors of different aspects of the same thing - one is process (picking up, putting down) and the other is 'use of knowledge' or 'skill' - all tied together in 'a good waller'.

Of course, both are necessary, but this simple phrase demonstrates a wealth of meaning both in process and knowledge. In one way, *knowledge* is demonstrated by 'good waller' (always picks up the right stone because he never has to put it down again – he can see by eye that this is the stone he is looking for and will go in the place he has identified as needing a stone of

particular shape and size) and *process* is demonstrated by 'good waller' (once he has picked up a stone, will find a place to put it on the wall, which will help the process on, and will not waste time). The elements of intuitive practice and particular or individual situations are well demonstrated here. The element of *chance* (which is reflected in some ways in complexity theory), which is always present in any real situation, is also demonstrated: the combination of learnt intuition and practice apparently combine to produce a situation where chance, although it is present, may be a lesser variable in producing a good result. We are reminded here of the problems of defining an expert and capturing expert performance (discussed by Feltovitch *et al*, 1997) and that real life learning is such a combination.

This 'maxim', in a particular context, can mean other things, such as:

You turn round, you pick up a stone and you wall it – if you pick up the right one, it would fit (Stephen, interview 5).

This phrase (as an instruction) is a deceptively straightforward statement of process. In this particular context, however, it relates to learning how to wall speedily, after some experience has been gained. It means 'do not move your feet, do not bother wasting time finding the 'right stone'. Simply make the stones you have fit'. This is appropriate for 'random' or 'non-coursed' walling. The additional phrase: 'if you pick up the right one, it would fit' (Stephen interview 5) adds to the complexity involved – are we picking up the right stones, or making them fit, a combination of both, or something else? The seemingly easy, relaxed, speedy process of 'a good waller' building a wall hides layers of possibilities.

Some wallers can only do coursed walls, or walls in a particular sort of stone. Some can do many styles. Some stone is very appropriate for random walling - such as mixed stone, stone of different types mixed together. This not only produces a result which looks good, but uses up stone as you come to it (a convenient and efficient way of walling) and results in a stronger wall.

As with other axioms, it has several meanings – it also means that if your eye is good enough, than you can see the right stone without much effort:

You haven't a need to tiddle it up a bit, you just wall it'

(Stephen, interview 5).

This phrase is from a teacher telling student to get on with it, rather than spend time making a stone fit. The phrase also relates to getting rid of fixed ideas and practices. Such automatic practice has been well described by Polanyi (1958), Dreyfus (1992, 2002a) and Goleman (1996) as being in 'flow'.

Another starting point might be to relate to the particular stone involved:

This stone is different- the way you do it is different – you have to hammer every piece (John, interview 13).

New Chiltern limestone, similar but not the same as old carboniferous limestone, has its own particular qualities, in where it will work by hammer or not. It 'rings' when you hit it and the waller can tell by the sound as to whether the individual stone will crumble, shape, or crack by the tone of the sound. As with other limestones, the level of waste stone (if hammered) is high and the unwary waller will, hopefully, quickly become to understand that the level of waste is not

only unrelated to the level of skill involved, but also that there are techniques which will build a useful wall efficiently whilst providing a good end result.

One early learner describes the process as a hard-learnt conscious process:

When you get down to the final act of placing a stone, you have a lot of thinking and chopping and changing, and putting on and taking off, unless you're very good, just to get a single stone right. So you've got to place each single stone but with a view in your own mind of what the final thing is going to be, which may be two days off (Don (1), interview 2).

This comment is of particular interest as an example of Polanyi's (1958) 'focal awareness' – even a novice student is aware (and is pointing out the need to be aware) of the end point of the exercise, many decisions and steps away, whilst getting on with the job. This exemplifies the complexities of the walling task at its best – getting on with it, recognising the complexity, and also recognising the conscious processes necessary. Interestingly, this description includes the phrase 'unless you're very good'. Assumptions are often made about 'innate skill' and about the amount of practice necessary to be competent. Both these assumptions are current in walling. Neither deals with how much of each are necessary, nor the interrelationship between the two – there is evidence that both are important and both seem necessary. There is no evidence of Dreyfus' (1972) or Benner's (1984) stages of learning:

I've learnt it all. It isn't instinctive (Don (1), interview 2).

On the other hand, the respondent can, and does, demonstrate an ability to build a good wall (He recently passed his initial test). There are individual differences in learning and individual differences in style and individual understandings of

how or what learning takes place. What is perhaps more common is an agreed understanding of what constitutes a good wall, which is relatively well described in the guidebooks (e.g. Brooks and Adcock, 1999). How long this might need to take to produce a result to a particular standard is commonly shared between practitioners, but is not easily made part of any written standards due to all the other variations of stone and geographical situation.

Wallerers can be disarmingly honest in their analysis - for example:

Q: Is that the right stone (Walter)? A: No, I've just moved it along. I had intended to use it in there, but I couldn't so I just pushed it along a bit. This is a problem wall, the shape of the stone, the unevenness (Walter, interview 4).

This detailed description demonstrates the complexity of the processes going on - the waller is not 'putting the stone down' – he is moving it to where it might fit in the same course of stone and then suggesting that the sort of stone is the current focus of thought or concentration, rather than the individual stone:

You can't record the stones. You're not numbering the stones and putting them back where they came from. You have to put the stones in and keep trying until you get it right (Walter, interview 9).

This describes the ongoing effort necessary, with some aim in view of 'getting it right', whatever that is – we assume the result that the waller and his peers might deem appropriate.

Another laconic interchange followed this line of thought:

How do you know it's the right stone? It fits - it's the bits either side of the right stone that's the pain, you know, you put one down there and it just fits. You can feel it - that's it, that's what it's going to be. And then there is a gap of two inches each side (Michael, interview 3).

There is some emotion expressed here about finding the right place (for the right stone) but clearly that is not the end of the story – this is a description of what could be seen as a series of problem-solving exercises, with a degree of satisfaction expressed when one problem is solved, but more problems remain to be solved (and on a bad day, more problems being created than solved.) Another angle was expressed thus: Q: “Was that a good stone?” A: “It was, but not just for there” (Michael, interview 10). The stone was right, but not the place. Perhaps there is some hope for all of us in this way of looking at it:

*So – if you've got the right stone, how do you get the next right stone?
- Act of God (Tony, interview 9).*

There was nothing particularly religious about that particular waller. He might well have been expressing the difficulty of ‘telling what you know’.

So what have we learnt? This phrase, ‘the right stone’ cannot be explained without reference to a wealth of other ideas, such as ‘the good waller’, ‘picking the right stone’, ‘placing’ the stone, or finding ‘the right place’. There is clearly emotion involved.

What is interesting here is not only the complexity, but the unique quality of some of the ideas expressed – the importance of ‘the right place’ emerged from these conversations without any leading questions. It is clearly as important as ‘the right stone’, both being necessary to successful practice. The ‘right stone’ can appear to be more easily understood, as a stone has some physicality, whereas ‘the right place’ might be seen as a more metaphysical entity. However, the more

important point to grasp is the essence of 'rightness', which applies to both. It is neither the place nor the stone (the qualities of 'rightness' can be attributed to either or both) which is crucial, it is the right combination of both together at the same time and place.

This chapter has discussed a range of 'problems' both relating to the materials involved and the processes. Problem solving weaves its way through the conversations and is a particular and necessary part of describing the process. However, the process cannot be summed up in this way, without reference to many other aspects of the process. Gardner (2001) suggests that you to work from the need of the wall, rather than the offer of a stone from the pile in waiting. Snow (2001) reflects on 'the right stone' in various ways:

Spaces are really the stuff that walls are made of (p.80).

Over the course of the day, I choose from a full variety of stone shapes. I have two choices when walling: finding a stone to fit a space, or finding a space to fit a stone. Both are ongoing options. Either way, the choice is immediate, and I don't dwell on its results (ibid. p.83).

Such is the artist's view.

Chapter 11 'One Man's Footing is Another Man's Through'

This phrase as with others, has wrapped up in it a wealth of experience – it might be just another way of saying 'people see things in different ways'.

However, it also has the specific meaning that if you have a large enough stone, it can be used in different ways and situations. A large stone can be used both as a footing or a 'through'. Again, it can mean that if a stone has been worked so it breaks and cannot be used for the purpose that it was originally meant for, it can be used in other ways, as in "one man's through is another man's topstone" (Chris, Interview 3), or "one man's waller is another man's filler" (Chris, interview 3).

Another conversation followed this train of thought:

A stone like this is long like this and it comes halfway. Should you use it as a through? Should you wall trace? To my mind – and there are walls that you come across with great long lengths of stone like that, Wales or wherever - perhaps if you haven't many throughs, you could turn that and use it as a through. (Stephen, interview 3).

This takes us to a discussion of not only what to use the particular stone for, but its relationship with other stones and their availability. Before you build your wall, sorting topstones is a necessity. Similarly, seeking throughstones is also necessary. Planning your wall is important, planning the size and shape of it, matching this to the amount of stone available, knowing that the materials you have available, such as many (or no) 'throughs', will affect this, all come in to play. But at what stages? Again, it is tempting to try and set down these ideas in a neat straightforward fashion. This is not, however hard you try, possible. You

not only learn as you go along, you make discoveries, which may change your plan. The stone may break. You may find you need to import more stone to finish the wall, opening up other possibilities. If you are going to have to bring in more stone, then why not bring in some 'throughs' if that is deemed necessary? Is it necessary?

Another variation of the phrase is "big hole, big filler" (Chris, interview 3). What does this mean? Again, it could be just another way of saying 'people see things in different ways'. It could be a technical phrase linked to thinking about the size of fillings necessary in a wall. It could be a warning not to waste good stone which could be a part of the face of the wall, by using it as a filling.

So what have we learnt? This phrase indicates at one level that people do see things in different ways. This is deceptively simple; however, in addition it denotes the need to plan ahead and the necessity to be able to change plans as circumstances dictate. More importantly though, planning ahead can only be possible if one already has the relevant knowledge. The first time you take a wall down, unless someone tells you, you would pile all the stone up together. Sorting out topstones would not be the first thing you thought about.

Whilst you were building the wall, topstones would not be ones you were concentrating on. You would (as have many new students in the past) use the good stones available to you in building the wall and end up without any topstones.

Changing your plans as you build appears another reasonably simple, easy idea. Doing it however, is, as we have found out many times already, rather different. The reality of the ongoing nature of 'doing practice' means having a regard for continually changing one's plans. Bearing this in mind as a series of rules at a conscious level is not possible in practice. Keeping a whole series of ideas or simple rules consciously in mind the whole time you are doing something simply does not work. Part of the nature of 'maxims' is to enable us to hold on to and recall many truths, many pieces of necessary knowledge, as we practise.

Somehow, as we learn, processes, including use of knowledge 'bed in' so that we do things differently. Understanding the context of this work is essential. This could be seen as exemplifying what Dreyfus (1972) and Benner (1984) describe as 'advanced' or expert stages of expertise. Again, however, there is no evidence that this happens at a particular level of knowledge or learning. We all have 'eureka' moments, no matter whether we have one week's experience or twenty years. These maxims are used at early or advanced stages of learning. There is no hierarchy.

Chapter 12 'The Essence is the Heartings'

As you build a wall, and if you are unfortunate enough to break a throughstone, there are always other uses to which the stone can be put, even if it is to use it as fillings. Nothing wrong with that. Fillings are important:

My old dad used to take me out and say the only thing that matters is the bit in the middle. Get the heart right and it works. Get the heart right - he used another word for it – fillings, whatever (Paul, interview 11).

To someone with some experience, these phrases are understandable. To a new waller, they are not. A new waller has to spend time concentrating on getting the faces of his wall right, avoiding running joints (one over two, etc.,) making sure things are 'to the line' and so on. The appearance of the wall is important as well as its strength. So why should fillings, or heartings, be important? They are part of a wall, to be sure, but (when the wall is finished) they are invisible. What is so important here?

The process of placing each stone, end in end out, with a face properly showing, with the right batter, means that each stone not only has to be placed, but 'set' or 'pinned' correctly. This 'pinning' is not the same as 'pins and lines'. This pinning is a small stone slipped in under the back of the stone you are placing, to ensure that the face of the stone is 'to the line', in line, at the correct batter, and so on. Shadmon (1996) describes this. You do this as you go, but what ensures that the stones you place and pin stay where they are? - the fillings, or heartings.

Describing the way to get a really good result, one waller said:

But if you want it really flashy, - the polish to finish, - you need a line to get it absolutely perfect (Stephen, interview 11).

In addition to using a line, to get a 'really flashy finish' you also need to have placed your fillings properly. Fillings support the two faces of the wall, support pinnings and ensure that the face stones cannot shift in their places in any way. Otherwise, the faces of your stones will (to a greater or lesser degree) tilt away or vary from the exact batter of the wall. Even with a new wall, this, to a trained or educated eye, is apparent.

Later, when the wall settles over time, these issues become more obvious, and in the 'worst-case' scenario, the wall settles with hollows and bulges, or even falls over. Old walls often indicate the importance of fillings: a wall falls when all the fillings have been washed out, older walls can be 'seen through', and a commonly understood measure of a new 'good' wall is one where you cannot see daylight through it.

If you are standing, assessing a new wall, working out whether the waller has used fillings appropriately, with a trained or an experienced eye, the proper use of fillings springs straight into your view. Each face stone, if it is pinned properly and supported by fillings, will have a face which follows the batter of the wall, and does not tilt inwards or outwards:

You mustn't throw your fillings into the middle of the wall (Stephen, interview 3).

The DSWA says this is an example of good quality walling – ‘fillings placed, not thrown in’. There is a temptation to throw fillings in, because it is a more speedy process, and using a bucket full of fillings and just tipping them in is a quick thing to do. Placing fillings properly at every course and ensuring they are placed so they settle properly, takes time and patience:

I always feel guilty throwing fillings in - you're not doing the job right. You're leaving a gap somewhere (Tony, interview 10).

Raistrick (1946) emphasizes the importance of fillings both in the process and in the result. Rainsford-Hannay (1957) points out that the descriptive word ‘hearting’ “is the *mot juste*” (p.48).

Proper use of fillings contributes to the essential strength and flexibility of the wall; when the wall settles, it remains as strong, or stronger, than it started. Some new wallers who latch on to ‘fillings being important’ may start to try and fit fillings together as if they were face stones. This, again, takes much time and is not good practice. The idea is not to make the wall a solid block of stone but to contribute to the wall’s flexibility. There are other tests, too:

They say if you can knock a stone and move it in the wall, you haven't got your fillings right (Stewart, interview 10).

I'm lucky, I've got plenty of good fillings here, I've got all sizes. (Tony, interview 10).

Knocking a face stone in a finished wall to see if it will move, is a traditional test, as is walking on top of a finished wall. It is clearly an appropriate test, as if a face

stone can be moved, then it, or its neighbouring stones, have not been set correctly.

Fillings are crucial to all walls, e.g.:

If you're building up and you've got a double skinned wall, if that's fillings, it's going to settle. If you've got a double skinned wall, yes it will settle, but it will settle naturally together. (Michael, interview 5).

or:

It's no good waiting until we've got that stint up and then coming for it (more stone in a barrow) because the stones will be too big. Now is the time to be taking some fillings and some wallers (David, interview 12).

Thus the acquisition and use of fillings makes us realise yet again that this, along with all the other processes described, are necessary to build a successful wall, and are totally and constantly interdependent with each other.

So what have we learnt? Fillings or heartings are not the most obvious part of the wall, and the obvious meaning of this axiom is, at one level, self-evident. One might also speculate about why fillings are referred to as 'heartings'. The importance of, and true nature of this 'maxim' of wall building only becomes apparent over time. If the fillings aren't right, the wall will not be right. To the trained or experienced eye, the correct use of fillings is obvious. Where the stone is obviously faced and coursed, then the fillings need to be placed correctly to maintain the effect. Where the stone cannot easily face or course, fillings still need to be properly placed, otherwise they will not do their job of supporting the faces. A wall with few or very poorly placed fillings will fall down in short order.

This is another 'maxim' which has to be understood as part of the whole process, in practice, 'as you go'. For a new student, it is remarkably difficult to do in practice, as the importance is not manifest in the building process, but only becomes apparent later. However it is a crucial axiom, as if not followed appropriately, it becomes impossible to correct it without starting the whole wall again.

This 'maxim' is another relevant example of Polanyi's (1958) rules of tacit knowledge: "...the correct application of which is part of the art which they govern..." (p.31). What is interesting is that it is part of the whole process of doing it (to an assumed good standard), an automatic part of what a good waller does. There is no immediate consequence to following or not following this maxim. It is a long-term issue which one needs to attend to. The result comes later, either through satisfied or unsatisfied customers, by positive (or not) recognition by one's peers, or by the obviously negative result of a wall falling down within a few years of being built. The positive result of good work is slower to emerge. There begins to be a collective element to this understanding. Snow's (2001) practical description of the maxim underlines the importance of building in this way, without describing its consequences.

Chapter 13 'You Can't Use What You Haven't Got'

You ain't got 'em, you can't use 'em (Stephen, Interview 3).

This deceptively simple statement conceals a mass of 'understanding' – it refers to material, usually stones – which might be of any category – footings, walling stones, 'throughs', tops, although it is most commonly used in the case of 'throughs'. If there aren't any 'throughs', you can't build a wall with 'throughs'. Occasionally you could make a footing into a 'through', or you could make 'throughs' into tops or wallers, if you had enough of them. Some big stones will cut down to smaller stones.

You ain't got 'em, you can't use them. Be prepared to overcompensate with fillings, so you've got your strength (Stephen, interview 3).

If you haven't got it, you can't put them in (Paul, interview 10).

Like many other rules or ways of talking about wall building, this one appears simple and is often quoted. However, as with other 'maxims', it has the quality of affecting all the other phrases we have used so far, but in a different way: all other phrases may have an essential truth and be interrelated, but if the stone isn't there, then other guidelines - which might have been thought to be forms of essential rules - may go out of the window. The question might arise as to how far this might be true – where are the limits of 'not doing' one of the other essentials? If there are no footings, can you build a wall? If there are no 'throughs', what then? Clearly, as above, there are ways round some of these difficulties. Are there any rules that cannot be changed in certain circumstances? Not that we have come across in this study so far. There are no 'context-free

rules' as described by Dreyfus (1972) or 'rules' that might be understood in science.

An apparently complementary phrase to this might be "what there is, it is necessary to use" (Sebastian, interview 5). However, this is not an exact complement. It means 'use all of what you have got to the best of your ability'. It is a statement of the necessity of working the best way you can in any given circumstances.

Another related maxim is 'it is necessary to use all of what you have got':

Every stone that comes off must really go back on (Michael, interview 3), rather than bringing more stone from somewhere else - which is similar, but again, not the same. It is a statement of the conservative principle of 'using what there is, conserving effort', otherwise:

We're going to end up with one hell of a lot of stone here (Walter, interview 3).

So what have we learnt? All is flexible. No rule is immutable. You do what you can with the material you have. This is summarized by one waller, talking about the style of wall to build in a particular area:

The decisions are made by looking around, what the other fields in the area is like, as you do wall in contour. People will say that they must do this or that. There is no musts because this area is just one mass of moles... I am saying to you now there isn't any hard or fast rule so long as the contour of the ground is rolling (Stephen, interview 3).

A wider tacit understanding is demonstrated: although all rules are said to be changeable, or modifiable, there is a common understanding of what a wall, or

what a 'good' wall is. This is domain-specific expertise. There is no suggestion here that it might be transferable. The relationship between the context, the particular circumstances and the individual's approach to that situation are all important – that is why learning is so complex.

Chapter 14 'It's All to Do with Practice - Getting the Mileage in'

We start with some quotes from weekend courses:

We take it down, we put it back, and with one or two day courses, all we can do is go through the motions and hope that something somewhere has triggered somebody's imagination - they'll never be able to wall with only one showing, but they will be bitten by the bug and want to come back (Stephen, interview 1).

Here we listen to the voice of experience in teaching weekend classes. Some people do not 'get bitten', some do:

It's about realising that several Saturdays is just that... several days... one year of Saturdays is, say, 40 days experience - not a lot - but on the other hand, you can demonstrate a lot of learning in a few weeks (Walter, interview 11).

Graham failed (his intermediate test) by one or two things that did for him that day, but then it's taken 4 years – 80 Saturdays – when you think of it that way, it really isn't a lot in a skill or craft - 80 days training (Stephen, interview 1).

From this we understand how important 'getting the time in' is and see a comparison between full time wallers and weekend wallers. This is also a demonstration of Schön's (1983) 'reflection-on-practice'. There are some commonly held beliefs about practice:

- Full time wallers get quicker at walling,
- Walling full-time produces quicker results because the process is faster,
- There are more days walling in a given period,
- Practice produces a higher quality result.

These are in fact only possible outcomes of practice. However, the experience of most wallers is that these beliefs are borne out in reality:

He's practised for a long time and he knows how to do it. We need to practise. The more we practise, the better we'll get. But it is practice. It's no good being told how to do it. You've got to actually pick the stones up and put them down again (Alistair, interview 8).

This next is again a classic reflection of Polanyi's (1958) 'knowing-how':

It isn't just mileage in the practice, either, it's mileage in the brain, to know what you're looking for, in that particular wall, that particular stage you are at in the gap... it's the mileage of your brain knowing what you want and automatically picking it up , fitting it and keep putting it on... because unless you can get to a stage where you can look and pick it up and put it on and move on and keep working at that pace, that's the pace that gets the gap. So if you can't and you struggle doing that, that's where it gets hard – and where you will know you will either give up, or decide to need to get on and improve (Stephen, interview 1).

Here we have the additional understanding that you learn things as you go, and that you learn somehow by understanding where you are and what is necessary to get better and then deciding to get better. Complexity is indeed in evidence, although Dreyfus' levels of expertise are not. The following are both reflections on which stage a waller has reached:

When I started, I was as doubtful as you (Stephen, interview 1)

I'm not sure whether I shall ever be good enough to make any money on it (Michael, interview 5).

There is also an implicit comment on future possibilities. The following phrase is loaded with implicit understanding - a poorly built wall has stood for 100 years – so is it well built or not?:

It's roughly between butchered and aesthetic' (Paul, interview 3).

This next summary description gathers together, yet again, the wealth of learning involved, because:

[They are taking down a wall] to some general rules but the main thing would be time (Paul, interview 3).

In other words, the people that built these old walls only had so much time to build them and yet they still stand the test of time, and look attractive.

Look at Chris now with the experience he's got. You just reach down, pick up what is next to you and you just wall it (Stephen, interview 3).

This teacher is describing a student 'just getting on with it'. The assumption is that with whatever amount of experience the student has had, he can do it without too much conscious thought. The student then said in response: "I feel comfortable (in doing it) because I've seen Steve doing it" (Chris, interview 3).

This is an absolutely classic example of 'learning by example', in the process of apprenticeship described by Polanyi (1958).

The next lengthy set of comments, referring to topping a length of wall, indicates how complex a situation can actually be:

You stand here and look down at it, you can't tell whether that's flowing or what it's doing. You can tell it rises to there and it's level to there. But if you put a top stone on there and a top stone at that end, you'll not be able to see, looking down on to it, what it looks like. If you go to the other side, put them on, and looking up at it, you can get that true line. Put them on as an experiment, look at it from this end, and tell me whether they're right or wrong. Wherever you put them, I dare bet you anything that looking down on them, you can get as better a view. (Stephen, interview 6).

This next quotation demonstrates reflection-on-action in the process:

So the flat ones out of your stint will come in here and the chocky ones out of their stint can come in here - this might want to go this way a little bit and go down into the wall a little bit to drop this height, which will mean the middle one there wants to be just that little bit higher. You're flowing up there and somewhere at this point here, drops flat? So at this point where it drops flat, if that is lifted, so that it flows up, this goes that way and you mirror how that kicks in. Somewhere in the middle here you can start to put some kinks in to start and take it over that bump and it's gradual (Tony, interview 6).

Normally you have a long length like this, we've set all out and just topped [but this time] you get it to look right. The broader chunkier ones can stand up to the line but in a long length of wall you're taking out all the kinks from the top of the wall but you are going to end up with a nice flat top. One day you're going to have to make a decision as to what tops you're going to have to make, whether they be laid over, or pointed or half round or whatever - but you can make that decision when you have got copestones that are big - they're big so you can trim the top off so that you can get them a nice finished top. But you will either stand them up on that slope or tap them downhill. But you will make a decision.

[later] Coming through to stones laid flat, coming through to chunkier ones, because we have a lot more smaller chunkier ones, to some medium ones, some big ones, then that works the same down there (Stephen, interview 6).

The sites dictate the different ways to plan a job, as well:

Because we've got a [varied] set of topstones [and] five different types of stones, maybe plan it out in your own mind, don't just put the first one on. If we'd have put four big ones on, like at the start, and got too much depth in here, where would we have been?... it's planning your job so you've got enough stones. I must admit I didn't know whether I would have had enough (Stephen, interview 6)

Again, reflection-on-action is demonstrated, but the relationship between teacher and student is not as clearly demarked as in Schön's (1983) work. Here the teacher is saying he didn't know the answer at the beginning of the job, either.

Again:

It's a retaining wall and in a retaining wall, there's a hell of a lot of work. And all the work is in the preparation, getting rid of the soil, what do you do with it? (Stephen, interview 8).

This might be a rhetorical question, but it reflects the importance of the practical, and the particular situation. This, and some experience of previous situations, is demonstrated by: "...step it up round the tree roots..." (Walter, interview 8).

The next refers to building on old wall foundations:

We need to get the old wall out. We need to come out to the true width and get out all the stone that's in there to be able to go down to ground level. When we first started this, I didn't realise how far down it was. I'm saying now we need to get that out. Now I'm going to put a line on the front of there. Try and keep within the confines of the trench if you can. Work that way so you keep the edge of the trench intact. So I'm going to put a line through – that's going to be the true line if the face of the wall. This is the angle- front side vertical, back side like that [with a batter] because as it settles, it's going to do that. So over the years, it's going to have a little bit of room to settle before it comes over again (Stephen, interview 8).

He's practised a long time and he knows how to do it. We need to practise. The more we practise, the better we'll get. But it is practice. It's no good being told how to do it. You've got to actually pick the stones up and put them down again; optimistically you do it once (Alistair, interview 8).

This comment was from a farmer who was practising in a class for the first time.

Clearly he knew what was needed. Another example of learning was expressed thus:

You can't record the stones. You're not numbering the stones and putting them back where they came from. You have to put the stones in and keep trying until you get it right (Walter, interview 9).

An expert would never have picked up [that stone] but I'm not an expert (Michael, interview 10).

So practice is understood to be important. It is not easily quantifiable, but is recognised as such. The amount needed is not easy to define:

It's the mileage in your brain (Stephen, interview 1).

Then again at a later stage of learning, we find:

Practice, experience, every bloody wall you take down, there is always a different element. Every gap is different, every gap. Even if you're just moving ten yards in the same wall, it's always different. There's always a different set of circumstances. (Stephen, interview 9).

So real learning is complex, there is much reflection-on-action at all stages of building and there are no context-free rules. We get this from an expert waller:

You never think you are an expert. You never even think about it. You just get on with it (Stephen, interview 10).

I go to a job, look at it and know what I have to do. Sometimes I don't know how long it is going to take, but instinct or experience tells you what you have to do (Stephen, Interview 1).

This illustrates the ideas of Polanyi (1958) and the 'expert' stage described by Dreyfus (1972) and Benner (1984).

Goleman (1996) refers to 'flow' and how an expert becomes almost unconscious in his practice. However, this is not necessarily the successful conclusion of the process:

If you're switching off, you're doing something - there's a danger then of becoming blasé and going the other way... and that's when you fall off the ladder (Stephen, interview 10).

There is no room for the Dreyfus' (1972) level 5 expert here. In addition:

Even for experts, you have good days and bad days and so there are times when you have to go back to thinking what the heck am I doing (Paul, interview 10).

When you say you are having a bad day - you know you are having a bad day and you either say well sod this, I'll stop and just walk away. And knowing that, that's expertise. It's knowing that it's not working- walk away from it (Paul, interview 10).

Emotion is expressed here. It is also evidence of knowing what is the right thing to do at a particular time. You can walk away, as Gardner (2001) suggests, or do something else for a time and return to a difficult task. Or you can try working

through a difficult patch and come out of the difficulty. It is important to keep on practising because:

It all just goes over the top of your head, you haven't a clue... until you get in there, then you sort of think, well, then it becomes apparent why (Stephen, interview 10).

'It's the mileage in your brain' (Stephen, interview 1).

There is a relationship between practice, reflection and conscious and unconscious processes.

So what have we learnt? Practice, as with other things, is not a simple thing: it consists in part of time spent understanding a range of experiences with different stone in different circumstances, building on what you already know, motivation, the ability to reflect and putting that into practice, a mixture of conscious and unconscious processes, an ability to cope with changing difficulties and the emotional reactions they produce. Not simple, but complex. An understanding of Dreyfus'(1972) and Benner's(1984) 'expert' level is demonstrated here, but not necessarily by experts. Even beginners can appreciate the need for practice. Polanyi's (1958) description of tradition, apprenticeship, and tacit knowledge is well evidenced.

Chapter 15 'Good Days and Bad Days'

We all have good days and bad days. This aspect of our lives is measured out in how the weather was, how we managed (or didn't manage) to get done what we planned to do today, and how successful we were in that, and in our descriptions of how we felt during the day and at the end of it. This is part of everyone's life. It is basic. We have good days and bad days at work, with our families and in relationships. Good days and bad days are part of the everyday round of life. We talk about them with our families when we come home from work.

In walling, good days and bad days are also part of the everyday round. What is interesting is that 'good days and bad days' are understood as such, often talked about, often described, with great detail, with the emotional concomitants, and are recognised as a very obvious essential element of what we do in walling. This is true of other occupations, but it is rarely seen as an important part of learning. It is underestimated in many different real-life and learning situations: the relationship between the person and the situation is often crucial, especially where decisions have to be made. Whether to take a risk or not is crucially affected by mood. This adds to the complexity of understanding how learning works. In dry stone walling, we have already understood that the practice consists of a constant decision-making process; placing each stone means making a decision. So mood begins to be a crucial element in practice. Sometimes a good day is really good and a bad day is really bad:

Well if you go to work in the morning and things are looking rosy and you get down and are faced with what looks like a little bit of a pebble in the bottom of a wall and it turns out to be a 3 cwt monster that's way out of line and you take about three hours to move the bloody thing, two of you, and you think should I move it or not? So then you set off three hours late and hey presto, you've lost some wages. So that could be a bad day. Or you've trapped your finger or whatever (Stephen, interview 1).

Good days and bad days are a recurring theme. These appear whether in paid work or unpaid work. There are several processes involved here: the process over the day's work, the process when you hit a problem – deciding what to do, and then having to do it, and then living with the results of your decision:

A good day you can go to the gap, and the birds are singing and it's pleasant and you get it up, no problem, and off you go (Stephen, interview 1).

We're just throwing it down to the pile and starting. We'll put a line on to get the foundations in and we're away, and at that point we'd still be full of the joys of spring and talking and laughing and one thing and another (Peter, interview 3).

"Why is it I have a bad day every day?" says one person (Michael, interview 5), describing his feeling about his abilities at the time – but "everybody has bad days!" (Don (1), Interview 2) is another reply, with a wealth of evidence to back it up:

If you are doing it for a living, I find that [if you are having a bad day] you can put it aside and you can pick it up again later (Peter, interview 3).

However:

I've got to be in the mood before I go out, otherwise I would struggle. You've got to be in that frame of mind, in the creative mode (Paul, interview 10).

and:

Sometimes you aren't [feeling good] but you feel the need to get on with it (Anne, interview 5).

In general:

Well the other thing, even for experts, is that you do have good days and bad days and so there are times when even you have to go back to thinking what the heck am I doing (Paul, interview 10).

Another way in which good days and bad days is evidenced is in descriptions of the cycle of the days work:

As the day progressed you've used all your good stone and were left with a load of crap, the concentration was at its utmost, you went quiet, and all of a sudden, you'd finished and the chat would start again, and you were away again. Just them few hours. If there was good stone to the top, the crap would be there all day, but unnoticeably it would all go quiet, and then all of a sudden one of you would say 'well, its good to know what time of day it is' and then you would start again (Stephen, interview 3).

So whether these processes are conscious or not, there is a flow to the day which relates both to the day itself and also to the supply or availability of stone and its relative ease or difficulty in using it. This last comment, of course, relates to how wallers work together on a job.

Even for an expert, there are times when the work comes naturally, and sometimes not:

When things are going easy in the morning, there's a good selection of stone, you get involved, and then as the day progresses, there is a point during the day when you are struggling and the old grey matter kicks in (Stephen, interview 1).

These times are documented here. So the idea of an expert performing at the same level all the time (a 'real' expert) is simply not one which works in reality. If we try and apply Dreyfus' (1972) and Benner's (1984) stages of expertise, we

see someone apparently moving between levels of expertise frequently and regularly. When things are going well, it is relatively easy, which means not much conscious concentration is needed, and then when things get difficult then more conscious effort is called for. There are also views on the type of day you are having, and what to do about it:

When you say you're having a bad day, you know you're having a bad day and you either say 'Well, sod this, I'll stop and just walk away. And knowing that, that's expertise. It's knowing that it's not working; walk away from it (Paul, interview 10).

However, of course:

If you're doing it for a living, you've got to crash on - you put it aside and you can pick it up again later (Paul, interview 10).

So there are conscious processes involved in deciding how to react to a bad day, and real decisions to be made to get the best out of what remains.

These processes can be seen in teaching walling as well:

There'll be some days you get up and you'll just be tongue tied and can't get it out. The experience is there but it's whatever happens that day (Stephen interview 5).

and

Everybody has bad days. I was saying, as a teacher, Don's ahead because of circumstances today. I learnt by somebody at the other side of the wall. All the experience in the world and me struggling to keep pace on the other side, but it's remembering that. When you're a teacher, instead of coming along and saying to Don, 'that's bloody terrible', it's remembering how you learnt, not thinking oh, I'm high and mighty and the instructor, and all that sort of thing. Even on a bad day and I'm pointing there and half the bloody stones don't fit. This last week or two I was struggling. I just didn't do it because I couldn't. My concentration wasn't there. Now I've picked that up, it's the exact thickness (Stephen, interview 5).

Other comments on good days and bad days reflect other aspects of the physical situation, and individual's views:

I've warmed up a bit now. Brain's functioning a bit better. It's going well (sardonic) because I've overfaced myself by taking down about four metres (Paul, interview 4).

and:

It's my third Saturday, and it's the second job, really, We did a stint up there and now we've moved, down, and each time I feel everyone else's stones are better than mine (Chris, interview 6).

Time flies when you're enjoying yourself. You look at your watch and think 'God-already'. There's no aggravation in this job, apart from the odd stone that just won't fit (and) except, I guess, when the rain's running down your neck and the wind's blowing and you're thinking: 'I could be in a nice little job in an office' (Tony, interview 10).

So what have we learnt? Whether a waller is having a good or a bad day, it is an integral part of the work process. Whether paid or unpaid, student or expert, the process affects everyone. There is a need to pay attention to whether the day's work is progressing, and to modify one's behaviour accordingly: whether to walk away, or do another job for a time, or put the job down and pick it up later. In addition, there is another theme here, about the cycle of the day, and the use of stone - as stone gets used up, the stone gets less easy to work and the process becomes more difficult. At this point we are told: "the old grey matter kicks in" (Stephen, interview1). As the job becomes more difficult, a more conscious effort is needed to continue. As this happens, if you are working with others, the conversation stops (because of the need to concentrate consciously) and then near the end of the day there is a conscious acknowledgement that there has

been that effort. Even experts have bad days – this is an acknowledged part of the process.

What is interesting here is that this acknowledgement and use of the knowledge of 'how it works' is central to the process and it helps the process along. You learn that difficult phases have different causes and are sometimes inevitable, and that you can get through difficult phases. There are rarely spheres of learning where this is so explicit. Gardner (2001) suggests "Move on if the work area temporarily defeats you" (p110). Goleman's (1996) view of the importance of emotion in learning is well evidenced. Descriptions of 'good days' are evidence of 'flow' occurring at times. Descriptions of the variations during the working day clearly bring out the realities of the practice situation.

Chapter 16 Other Emotional Aspects of Walling

These emotional aspects are demonstrated, for example, on weekend courses:

You can get totally locked into dry stone walling. You can lose track of everything - time – anything. People go away from a walling course and they are totally changed. It can change their lives. It can do. (Stephen, interview 1).

Some courses are deliberately designed for people who have stressful jobs, to use the therapeutic aspects of learning the craft to focus on something other than their usual jobs. Although some crafts are said to be characterised by repetitive tasks (McEachren, 2004), the therapeutic aspects of these walling courses appear more to do with concentrating on the aspects of relating to a new task, which involves working with and concentrating on a new physical material, and involving the use of often unused manual skills:

It's therapeutic, really, takes your mind off all sorts of other things (Walter, interview 8).

In addition, the self-assessment aspects of these courses allow the student a completely different way of assessing themselves, with (crucially) a very real physical result for their efforts:

They'll never be able to wall with only one showing, but they will be bitten by the bug and want to come back (Stephen, Interview 1).

When a waller has more experience, then this can happen:

When I am walling I switch off. I've done it that often that unless there's a serious problem, I switch off (Stephen, interview 1).

This statement is a good description of Dreyfus' (1972) level 5 expert. The following, however, is not:

When things are going easy in the morning, there's a good selection of stone, you get involved, and then as the day progresses, yes, you switch off, but there is a point during the day when you are struggling and the old grey matter kicks in (Stephen, interview 1).

This takes us to a stage beyond Dreyfus' (1972) level 5. What is interesting about this process is that it describes the links between the very conscious and the less conscious processes and how they link and develop. At whatever level of expertise, wallers sometimes struggle, and this is an accepted 'fact'.

Whether walling is unique in linking physical demands and mental demands towards an emotionally satisfying result (other crafts such as thatching might make such a claim), the relationship between the two is important:

That's the fascination, actually, the physical demands and the mental stimulation, despite that, somebody from the outside might not think so... for most people [from the outside] looking at dry stone walling [watching people doing walling] is downscale from watching paint dry (Don (1), interview 2).

There are warmly positive views:

A decently built wall, preferably one that's been there for decades, is very pleasing to the eye, isn't it? (Don (1), interview 2).

You don't have to be right next to a wall to feel the stone, you feel the stone even though it's two miles away (Don (1), interview 2).

and there are other ways of seeing the result:

It's a lovely thing. It is made lovely by the fact that some very hard [working] and poorly paid peasants put the damn things up (Don (1), interview 2).

Gardner (2001) has a whole chapter on 'Why walls are beautiful'. He concludes: "Build one yourself. You'll see" (p177). Sometimes doing walling can be like other work tasks – worrying:

And then I lied tossing and turning and thinking I've done it wrong. I've misled them. And when we go back, we'll have to take it all down and start again. In the event we didn't because it was alright. It was just my nightmare (Walter, interview 5).

How do you know it's the right stone? it fits - it's the bits either side of the right stone that's the pain in the arse... you know, you put one down there and it just fits. You can feel it - that's it, that's what it's going to be. And then there is a gap of two inches each side (Michael, interview 3).

This last could be seen to be an interesting example of 'intuition' described by Dreyfus (1972) and Benner (1984), but 'intuition' being demonstrated only as part of a process. Practice and reflection are graphically summarised:

*So, if you've got the right stone, how do you get the next right stone?
Act of God (Tony, interview 10).*

*I always feel guilty throwing fillings in - you're not doing the job right.
You're leaving a gap somewhere (Tony, interview 10).*

References to 'getting it right' and the ethical implications abound.

So what have we learnt? Feelings of intense involvement in the process, of fascination, a love of the materials being used, a pride in 'doing it right', involvement to the point of being able to 'switch off' or (at times) losing the need to act consciously, all apply at times here and are acknowledged to be important. These can be seen perhaps as related to more generic processes (the 'craftsman's pride in his work') but some of these processes are akin to feelings

related to performance (or other forms) of art at their highest level (see for example, Snow (2001) and Goldsworthy (1994, 2000)). Wallers feel things about walls, and they employ feelings in the process of 'doing it'. Of course, some people do not find walling fascinating, and drop out. The ones who remain involved over any period of time, however, are involved because of the context – they are valuing things outside themselves – walling for its own sake, not for their personal sake. They are not there to prove to themselves (or to others) that they are competent by taking an easily measured test. This externalisation is evidenced in the descriptions of 'flow' during the working day.

Chapter 17 There are Rules and There are 'Rules'

Like the scientific bit if you like? It's tried and tested – not necessarily rules, but sensible guidelines – it isn't rules as such, it's tried and tested (Chris, interview 3).

This was the response I got when I asked about 'the rules' of walling: the response was one showing an academic understanding of a rule, and a completely different interpretation of what goes on in walling. There are no 'rules' as absolutes in walling – the rules arise out of what we have called 'experience' – the combination of the time spent, the different incidents and environments experienced and the understanding gained. These have been 'tried and tested' by many people and the summary is 'the rules'.

Another way of describing the rules was stated as: 'we're walling to Mr Harrison's rules' (Walter, interview 4). This is an elegant reference to an apprenticeship process (as discussed by Polanyi, (1958)). Mr. Harrison is, in this case, the teacher present at the time. If there were another teacher, then the rules might be different. This is a different way of looking at rules – it is a description as to 'who is in charge' – the person to whom we defer in decision making. As we have found before, there are times when you have to make a decision, given all the circumstances of a situation, and live with the consequences. This decision is owned by the person in charge of a class or group, in this case a master craftsman, who is recognised as having the necessary experience to be able to make those decisions. There is no serious argument between a new student and a master craftsman – it becomes obvious in the practice, the doing of the class,

that the teacher 'knows more than he can (or needs to) tell'. The teacher simply knows more, can do more, and is used to more situations and problems.

In conversation with a master craftsman, about building a slate wall (a wall of large flat slates set vertically, which is now rarely made) I suggested that it was a complicated process. He said 'It's just trial and error' (Andrew, interview 11). This is, however, trial and error by many people over a length of time. There is a collective knowledge within the walling community. When I asked others what the rules were, I was told: 'Take the wall down. Save the fillers, save the throughs' (Chris, interview 3).

This is the way you do it:

You've to put the largest stones in on the base and where the land falls away, then we put in a - what's it called? - a scarsement. And we fill up with fillings, I suppose, as we go up. And every now and again we put in what we call a 'through' into it which binds the wall together. Unfortunately we haven't been given many throughs. They're scarce are throughs, Well, we're given obviously what we pull down. We just simply pull down what there is and build it back up as best we can (Nick, interview 4).

So there are rules, but they are not hard and fast rules. You do what is necessary to get the best results. When building a wall up a hill, there is a 'rule' that says that when the wall gets steep enough - the BCTV Handbook (Brooks and Adcock, 1999) says "...lay the stones on the true horizontal, *whatever* the slope..." (p.63), then the courses of the stone, instead of following the course of the ground, must start being built horizontally into the ground. However:

The decisions are made by looking around, what the other fields in the area is like, as you do wall in contour. People will say that they must do this or that. There is no musts because this area is just one mass of

moles... I am saying to you now there isn't any hard or fast rule so long as the contour of the round is rolling. When the ground gets to a certain pitch, they must be walled into the ground. It's nice for rolling or undulating to follow the ground. But then when it gets to a certain steepness - it has to be quite steep – then you start to put walling into the ground. But with wall heads to stop it all slipping (Stephen, interview 3).

So there are no hard and fast rules:

Q. How did you learn that? A. By trial and error. Everyone learns through their own mistakes and I'm no exception (Stephen, interview 1)

In certain situations, you simply have to do different things... like one over two, two over one, it's a sort of rule, but if you've got to a certain point where you've got a certain stone that has got to go in, then you're not going to be repeating that particular rule the whole time, you're simply going to be getting on with it (Don (1), interview 2).

In other words, you cannot just have a set of conscious rules that you work to, and sometimes they get in the way. You have to just get on with or work 'backwards' from what you are trying to do, instead of trying to work forwards from the rules. Polanyi's (1958) 'focal awareness' is clearly demonstrated:

In whatever circumstances you find yourself in, those guidelines can be moved (Chris, interview 3).

And with the rules and everything we were talking about, the rules – the overriding thing is the strength (Stephen, interview 3).

This again means many things - the strength, referred to before, means also the ability to be flexible.

So what have we learnt? Rules as absolutes are not what we are dealing with here. We are dealing with a complex set of rules of thumb, some of which are consciously followed at times, some of which are consciously not used – you just have to 'get on with it'. What rules there are can be changed, and are,

depending on circumstances. Recognised experts are the repository of the rules. The rules of putting up a wall are statements about 'what must be done' or 'what is normal to be done'. 'Trial and error' is another name for collectively accumulated wisdom. There are no context-free rules. Maxims are shared by learners and teachers at all levels of expertise.

Chapter 18 Learning From Your Mistakes

Dunphy and Williamson (2004) refer to Dreyfus' (1972) model as one of trial-and-error. We all make mistakes sometimes. Wallers make mistakes sometimes. Walling mistakes can be crucial (the wall falls down) but are not often immediate. Poor technique can be seen by wallers who have some knowledge, and there is a reflective peer-review culture in walling:

You'll learn by your mistakes - I shouldn't have done that, how can I wall on top of that, oh that doesn't fit properly, how the hell am I going to wall on top of that? So in keeping pace with Nick, I walled that in. I shouldn't have done (Stephen, interview 3).

Learning from mistakes consists of reflection and decision-making, and a determination to do things differently next time, and to put this into practice. There is much discussion and talk about learning from your mistakes and there is some obvious practice in 'standing away from the wall and observing' either during the day, or at the end of the day, either by yourself, or with others. This is an obvious part of the examining and standard setting of the DSWA. There is less discussion and less obvious understanding about how to translate understanding of one's mistakes to changing one's practice. There is little understanding of how knowledge gets translated into new practices whilst at the same time remembering all the other things that need to be remembered:

It's the willingness to learn, and not be frightened of learning, not being frightened of trying things differently, not being frightened of assessing what you're doing. Have I done that right today? Let's try it differently... it's assessing what you're doing all the time. (Stephen, interview 1).

So part of the process is doing as you go along. Does making mistakes help you learn? Only if you recognise them as such: 'I've made many mistakes' (Don (1), interview 2).

So what have we learnt? Mistakes can be a good thing: allowing ourselves to make mistakes and learn from them is a demonstration of flexibility in learning, and permits complexity. This is very different from the sort of learning which focuses on 'the one right answer'. As we have found, in dry stone walling, the 'answer' is a unique combination of many things. For example, the context, (the type of stone and the weather) the individual and emotion. It involves 'learned intuition in practice'.

Although we talk glibly of learning by our mistakes, this is neither simple nor obvious. We need to recognise our mistakes, but not be held up by them. We need to understand our mistakes and work out ways of doing things differently, as a result. We then need to actually do things differently. Complexity is again apparent, as is reflection-in-action and reflection-on-action. The motivation to learn new ways of doing things is crucial.

Chapter 19 The Obvious, Practical Things

Bring your lunch, have the right clothes, wear boots with steel toe caps (Craven College handbook).

Warm clothing (Chris, interview 3).

Interestingly, there is a mixture of practical advice and 'health and safety rules' - which are dealt with in a very practical way in walling situations and classes. Sometimes they are discussed in a way which recognises that they are relevant but with unstated caveats – for example, there is a rule about throwing stones (you are not supposed to) – but clearly there are situations where it is regularly necessary – the result of following this rule 'to the letter' would have other implications:

The difference between placing every stone on the ground and throwing it would be fairly large in terms of time taken (Stephen, interview 3).

There are 'rules' about lifting stone – the health and safety rule about lifting from the knees is not stringently followed, but if a stone is too big for one person to move, then it is recognised that asking someone else to help is necessary, particularly when it comes to placing big stones like 'throughs'. This allows the stone to be placed with the least disturbance of the courses beneath. Wearing protective clothing like gloves, boots, and goggles is followed in practice, to the letter in some instances, not in others: proper footwear is used regularly. The use of protective eyewear (goggles) is not. Most wallers have a pair of goggles somewhere, but do not use them. This is, in the main because goggles make the job impossible to do as they 'steam up' constantly. 'Placing tools safely on the

ground' is followed to the letter where crowbars are concerned (a pointed crowbar can take your eye out) but sometimes not where spades are concerned.

The need for a 'rule' about leaving a 'safety' space between your wall and the pile of stone you are using is less than obvious at first. In practice, when you have laid out your topstones and start taking down the old wall, it becomes clear very quickly whether you have left enough space at all for all the stone that is going to come out of the wall. So then final footing stones get piled on the stone already 'ridded out', which can get to be a major problem in circumstances of limited space (such as the inside of a corner).

So what have we learnt? There are some obvious unstated rules, some of which are very quickly learnt – forgetting your lunch when walling miles from a food supply is not repeated. There are some stated rules which are followed, and some which are not. Practice differs from 'the rules' when it needs to. These rules become habits or instinctive in practice over time.

Chapter 20 Working Together

Raistrick (1946) describes the way people need to work together:

A common method is for two men to wall face to face, one on each side, with possibly a boy to place fillings (p.18).

There is very little written about people walling together, even though, during the enclosure periods of the late 18th and early 19th centuries, walls were built by gangs of men who, as Rollinson (1998) describes it:

...bivouacked on the fells close to their work, walling from sun-up to sunset, and coming down the valley to settlements only at weekends... (p.6)

Wallers do sometimes work together and the two-people-facing-each-other method is common, as it allows good communication and means each waller has a view of his own progress and the progress of the other. Some walling competitions are still run for 'pairs'. Working together also allows the individual space to work unheeded by the other. If one waller gets ahead, then to keep the wall safe, the person in front needs to be placing fillings, to keep the wall stable and allow the other to keep up. A wall in the process of being built is not stable if there are two courses higher on one side than the other. Working with someone else can help you speed up the job:

In working to keep pace, you'll know all the basics, however long you've been doing it. You've somebody at the other side pulling you on. Then that brings the speed on. Not necessarily the standard. The standard will drop a little bit and there's nothing you can do about it. Which is why I'm doing this now – making you just pick up and work because I'm hoping Nick at the other side is going to do exactly the same (Stephen, interview 3).

In addition, working together can mean changing jobs or the pace of the job:

Working as a team, so if Don was working ahead of me here, Don could then take charge while I'm struggling to try and get caught up. Don can then take charge putting the fillings in, which, as a team, is bringing that wall up. It's helping whoever is behind at this side – if I'm behind, - giving me the chance to get caught up. Don is backfilling, flashing stone off, and maybe able to sort a few stones out himself as he gets a little bit higher (Stephen, interview 5).

If you've limited fillings there you could come to this side if I was behind, it's getting that wall up. As it is now, it's a course [a training course] and it doesn't matter, but if you were working as a team, this section ought to be able to be finished before it gets dark, and it's coming dark in half an hour or something, We're all under a bit of stress, and I'm knackered. It means you can put a few fillings in – maybe not on your side, but it's getting that wall to a finished product, and money in your back pocket (Alaistair, interview 5).

Finishing off the job to a point where it can be safely left for the night, or until the job can be finished, is important for practical purposes (animals will dislodge topstones that are not set properly). Snow (2001) goes further, describing the Bhuddist belief that if stonework is left unsecured at the end of the day, the waller would not be able to sleep well at night.

It is also necessary to wall to the same line for 'throughs':

If you're both working together as a team, if you look and say, - well this is the course where we will come in with the next set of throughs, you need to know where you're putting them, because at a particular point it needs to be level, at another point it needs to be level, and another particular points it needs to be level. If you're not communicating, and you don't know where they are, you are both at a tangent (Walter, interview 7).

Getting the stone to the line works with:

...any stone, because if you are working along and you are getting spot on to the line, you'll be wasting a lot of nice little flat stuff - and time. If you

say, right, that's where we want a through, that's where we want a through, you just get them level at that point (Walter, interview 7).

There is also the rule that: 'whoever's in front dictates' (Richard, interview 9).

So what have we learnt? Working together as part of the process of building a wall brings with it its own complexities. If both wallers have their eye on the end goal, work problems can be (and do get) sorted out on the way. The rhythm of the work day and the chance to communicate about what one enjoys doing, is a motivating factor. Conversations involving maxims occur. There is little distinction between learners at different levels of expertise. Certainly it is impossible to distinguish specific levels of expertise by words used, or by process. Speed of building and 'neatness of finish' tend to be more straightforward distinguishing characteristics.

Chapter 21 Conclusion

21.1 Introduction

This study of dry stone wallers' learning has examined what happens in skill learning situations, and how learning takes place in practice. The key aim of this work was:

'To understand the nature of expertise in dry stone walling, how it is understood by those practising the craft, and how it is transmitted to others'. This formed the basis for the research questions:

- what happens when dry stone wallers are learning their craft?
- how do they acquire expertise in dry stone walling?
- how is this learning communicated?

The study was carried out over the periods June 2000 to April 2001 and from early 2004 to September 2005. There was a break in the interview process due to the national outbreak of foot and mouth disease. The latter interviews were recorded in the 'learning situation' of a Further Education class supported by a local college. These were interviews or conversations of varying lengths, from an hour to two hours overall, which were recorded whilst the group were involved in building walls in various locations. The number of participants varied, depending on the attendance of the participants in the class. In total, there were 17 interviews which involved a total of 23 respondents of varying experience.

The material obtained was analysed under seven different themes:

- 'Knowing how'
- The use of tacit knowledge or intuition
- 'Flow'
- Constant decision making, reflection and learning from mistakes
- Individual and subjective variations and experiences
- The relevance of emotion
- The use of 'rules of thumb' or maxims.

These themes arose from both the literature and the data gained from the interviews. The literature provided analytical possibilities which 'meshed' with the interview data in a complex manner. The data was collected and arranged in patterns which emerged as the interviews progressed. The interaction between the data and the literature was positive and helped the analysis progress.

21.2 How Expertise is Acquired in Dry Stone Walling

The findings are here summarised and analysed under the 7 themes, and related to the literature.

21.2.1 Knowing How

'The learning is in the doing' is evidenced in many ways, particularly in Chapter 14, where we find knowledgeable wallers making links between practice and understanding, for example:

It isn't just mileage in the practice, either, it's mileage in the brain, to know what you're looking for, in that particular wall, that particular stage you are at in the gap... it's the mileage of your brain knowing what you want and automatically picking it up , fitting it and keep putting it on... because unless you can get to a stage where you can look and pick it up and put it on and move on, and keep working at that pace, that's the pace that gets the gap, So if you can't and you struggle doing that, that's where it gets hard – and where you will know you will either give up or decide to need to get on and improve... (Stephen, interview 1).

Links are also made to observing others:

I feel comfortable (in doing it) because I've seen Steve doing it (Chris, interview 3).

Knowing how also leads to understanding:

It all just goes over the top of your head, you haven't a clue... until you get in there, then you sort of think, well, then it becomes apparent why... (Stephen, interview 10).

The findings agree with some of the literature on the theme of expertise, clearly supporting the work of Polanyi on tacit knowledge (Polanyi, 1958; Polanyi and Prosch, 1975; Polanyi, 1983), Fitts and Posner (1967) on sport, Booth *et al* (1995) on surgical skills and Snow (2001) on walling. It may be that this particular form of activity, involving co-coordinating hard physical activity with demanding brain activity, is a particular situation from which it is difficult to make generalisations. However, most human activities involve both brain activity and hand-eye co-ordination in varying degrees. Thus we find support for Polanyi's (1958) work generally and an emphasis at a philosophical level that walling is a relevant topic of study.

'The knowing is in the doing' tells us about what happens when wallers are learning their craft. This is a complex process, involving deep concentration on a range of individual problems, much physical activity, yet with a need to constantly have an eye for the outline of the finished product. There is no classroom, no separate place for theoretical study, no unattached 'textbook' theories. There are no 'context free elements' as espoused by Dreyfus (1972) and Benner (1984). Therefore the practice evidenced here does not reflect the literature. Expertise is

acquired by much practice, much reflection, and the interaction of teacher and pupil in a mutual recognition of the importance of 'getting it right' and the understanding that a master craftsman is someone who can demonstrate a high level of skill.

The wallers in this study, both teachers and students, were highly motivated. They acquire expertise in a wide range of ways, both by following the teacher's example, and by much practice. They were all deeply involved in their activity and perceived its value: they communicated their understanding of the importance of 'doing it' in very graphic ways. They were clear: the best way of communicating this learning is by participation. Thus the particular form of group interviews, whilst building a wall, arose.

In summary, some aspects of the literature, particularly those of Dreyfus (1972) and Benner (1984) were not supported by this part of the study.

21.2.2 Tacit Knowledge

Tacit knowledge is ever-present and expressed in a variety of ways. Intuition or 'doing it without having to think about it' appears to grow as experience builds up. This is still subject to a wide variety of individual variations. During the time we learn by doing things, our learning 'sinks in' and becomes 'tacit knowledge' or 'intuition'. Expertise is about expressing this 'learnt intuition in action'. Barber (2003) says:

Somehow that knowledge just seemed to be embedded there through years of experience (p.140).

This study demonstrates a wide range of examples of how tacit knowledge is forcefully present in the practice of walling. The often-repeated axioms of 'end in, end out' – for example:

End in, end out (Chris, interview 3).

End in end out so you've got your strength, when there aren't enough throughs (Stephen, interview 3).

or 'it's all in the hearting', for example, are clear demonstrations of how learning takes place. These axioms are used as comments, questions, instructions, hooks to hang conversations on, used in conversations between teacher and student and between students, sometimes as a chant whilst a waller focuses on a particular piece of work. They express, in a shorthand way, the many subtleties of the process of building a wall. They are most often heard as laconic comments e.g.:

*So –if you've got the right stone, how do you get the next right stone?
- Act of God (Tony, interview 9).*

They can also be used jokingly between wallers as a way to pass the time of day in their joint passionate practice, in either good or difficult circumstances. The use of the axiom of 'to the line' demonstrates the very nature of rules of thumb, in that they are not 'rules' in the simple sense, but rules with multiple meanings in multiple contexts.

The findings agree with some of the literature on the theme of expertise, clearly supporting the work of Polanyi (1958), Polanyi and Prosch (1975) and Polanyi (1983) on tacit knowledge. The higher levels of expertise as expressed by Dreyfus (1992) and Benner (1984) are clearly demonstrated:

I go to a job, look at it and know what I have to do. Sometimes I don't know how long it is going to take, but instinct or experience tells you what you have to do (Stephen, interview 1).

This study also supports earlier descriptions of walling, such as Rainsford-Hannay (1957):

Stand and watch a skilled man building such a wall. Aimlessly, it would seem, he picks up a stone for the double dyke, but with no hesitation he finds a place for it, a place where it breaks joint, where it finds a firm bed and where it supports its neighbours (p.31).

Tacit knowledge, according to Polanyi (1983) is ever present in all our activities. According to him, we always “know more than we can tell” (p.4). This study would suggest tacit knowledge is present in the early stages of learning as well as the later stages of expertise. There is no general time in the process of learning where tacit knowledge suddenly appears to be in use. Learning is a gradual process, communicated between expert and student in a variety of ways, (demonstration, discussion, reflection jointly and together). Although there may be ‘aha’ moments in many learning situations where knowledge suddenly becomes conscious understanding, these are not concentrated at any one point in learning this craft, they occur to novice and expert alike.

We all have a huge range of tacit knowledge (riding a bicycle, for example) which we acquire and use all the time. Walling is no different from other processes in

this respect. The idea of separate stages of learning expressed by Dreyfus (1992) and Benner (1984), where tacit knowledge 'suddenly appears', however, is not supported. Wallers acquire and use both conscious and tacit knowledge when they are learning their craft. Tacit knowledge is transmitted in a range of ways (demonstration, discussion, reflection jointly and together). Tacit knowledge is expressed in many ways, particularly in the form of maxims or 'rules-of-thumb'. In summary tacit knowledge is ever present in this study, contrary to the theories of Dreyfus (1972) and Benner (1984).

21.2.3 'Flow'

'Flow' is evidenced not only by master craftsmen, but by learners at every level. It is graphically demonstrated by 'good days and bad days'. On 'good days', we have evidence of how this works:

When things are going easy in the morning, there's a good selection of stone, you get involved, and then as the day progresses, there is a point during the day when you are struggling and the old grey matter kicks in. (Stephen, interview 1).

Flow comes and goes, depending on its interaction with other aspects of learning. This gives us a deeper understanding about the complexities of learning. We also find flow linked to positive emotional states:

Time flies when you're enjoying yourself. You look at your watch and think 'God - already'. There's no aggravation in this job (Tony, interview 10).

Benner (1984), Dreyfus (2002a), Dreyfus and Dreyfus (1986) and Goleman (1996) all emphasise the concept of 'flow', where a practitioner becomes totally engaged in their occupation. This study finds ample evidence of such states,

but also finds evidence at every level of expertise. It is not only experts that experience 'flow', but novices. The total preoccupation with the task to the exclusion of all other things is well evidenced. There appears to be something particularly preoccupying in the whole activity of building a wall, which many wallers experience. It is possible that relates to the centrality of physical activity to students who are not used to this: even at the detailed level of this study, we have no physical evidence (such as brain scans) to demonstrate changes in brain activity associated with flow, as suggested by Goleman (1996). What we have are many accounts of a state of mind, of total preoccupation, of enjoyment of the activity to the point where other things become not important. This adds to the learning experience in a very positive way. Wallers can and do describe this as a normal part of the learning experience.

In summary, therefore, this study supports the existence of emotionally positive engagement with the task at many different stages of learning, which might be examples of 'flow'.

21.2.4 Decision Making, Reflection and Learning from Mistakes

Schön (1983, 1987) emphasises the essential nature of 'reflection-in-action' in learning, and also 'reflection-on-action'. Benner (1984) also focuses on the need for reflection. Rolfe (1997a) develops these ideas, particularly concerning intuition and reflection in the acquisition of expertise. Beijaard and De Vries (1997) agree, stressing the importance of the need to solve problems by reflection, and the role of emotion in learning.

Wallersteins constantly reflect, both individually and jointly, to learn from their mistakes. This takes place in formal sessions and informally, depending on the style of the group. Wallersteins stand back and examine their work, sometimes at the end of a day, sometimes more often. As they learn, they realise that this is an integral part of what is necessary. By 'learning by your mistakes' in practice, they begin to realise that if they do not keep an eye on what they are doing (both consciously and subconsciously) then the wall will not work as it should:

You'll learn by your mistakes - I shouldn't have done that, how can I wall on top of that, oh that doesn't fit properly, how the hell am I going to wall on top of that? So in keeping pace with Nick, I walled that in. I shouldn't have done. (Stephen, interview 3).

Thus this study bears out the literature on reflection, and Schön's (1983,1987) conscious processes of 'reflection-on-action' and 'reflection-in-action' and other more complex, subconscious processes are demonstrated in this study. More interestingly, wallersteins learn to reflect more regularly as they become more expert, learning how to learn, for example:

Because we've got a [varied] set of topstones. Five different types of stones, maybe, [so] plan it out in your own mind, don't just put the first one on. If we'd have put four big ones on, like at the start, and got too much depth in here, where would we have been?... it's planning your job so you've got enough stones. I must admit I didn't know whether I would have had enough (Stephen, interview 6)

The results of not reflecting become very apparent over time, in joint discussion sessions. Reflection becomes an inherent part of the process of becoming an expert. This works at both the individual level (thinking about what you are doing) and the interpersonal level (discussing what you are doing). Reflection becomes

an automatic part of the process. It becomes clear over time that reflection is necessary to acquire expertise. Wallers reflect with each other both during the work and at the end of the work day.

Constant decision making is also a critical part of the process, for example:

When you get down to the final act of placing a stone, you have a lot of thinking and chopping and changing, and putting on and taking off, unless you're very good, just to get a single stone right. So you've got to place each single stone but with a view in your own mind of what the final thing is going to be, which may be two days off (Don (1), interview 2).

This is also noted by Raistrick (1946):

Every stone he lays or hews demands the exercise of a certain amount of judgement for itself; and so he cannot wholly suffer his mind to fall asleep over his work (p.26).

Learning from mistakes is also crucial, involving both the recognition that mistakes are made, and understanding that they can be corrected:

I've made many mistakes' (Don (1), interview 2).

In summary therefore, reflection, constant decision making and understanding and learning from mistakes are all essential parts learning dry stone walling. This accords with some of the literature on reflection, but indicates that it is a more subtle, complex process than is expressed by Schön (1983, 1987).

21.2.5 Individual and Subjective Variations and Experiences

This study demonstrates a wide range of variation in learning styles, and in the pace of learning. There is no set time by which a person can expect to become expert. Individuals vary in their styles over time as well. People have 'good' and 'bad' days, and 'patches', which can be part of a day, or several days long. Dreyfus' (1972) and Benner's (1984) attempts to demonstrate 'stages of learning' reflect, perhaps, the style or the way that skills are taught, rather than the way they are learnt.

This study supports Polanyi's view (1958) about individual learning, its immediacy and its personal nature. We all have 'eureka' moments and we all have experience of learning becoming automatic, or habituated. The wallers in this study show not only that this is a complex activity, but that it does, in some ways, over time, 'become second nature'. As in playing the piano, with enough practice, the physical activity speeds up, bypassing conscious thought processes. Although this cannot easily be explained, it represents deep learning and insight which can be appreciated by those who participate (Biggs, 1987).

At the theoretical level, it may be that in order to simplify explanations of learning, we attempt to arrange our knowledge in tables, or stages, or hierarchies. Sometimes, however, this simplified explanation may not reflect deep learning. Several of the theoretical perspectives attempt to simplify learning into a series of 'stages', e.g. Dreyfus (1972), Dreyfus and Dreyfus (1986) and Benner (1984). Critics of Dreyfus and Benner (e.g. Hargreaves and Lane, 2001) have pointed

out that these models do not easily fit the real world. Pinker (1997, 2002) and Rose (1992) make a persuasive case that complexity is in the essence of 'doing' and not easy to understand. From studies of expertise in education (Berliner, 2001) we find recognition of the importance of many different influences, such as talent, deliberate practice, context, problem-solving and adaptability. In studies of sport, Boyle and Ackerman (2004) points out large differences both within an individual as they learn, and between individuals. Latash (1996) points out that even in relatively simple skills, individual variation in learning and performance is important.

This study supports the literature in describing the complexity of learning and the myriad ways in which we learn, over time and in different contexts. This study does not support generalised statements about 'how long it might take to become an expert'. Definitions of expertise are contested, and any generalisations are suspect. When wallers are learning their craft, both teachers and students bring their unique experiences into play. These unique experiences build together in the learning environment to create further learning. Expertise is acquired as part of the practical experience of building a wall alongside others with different levels of expertise. Wallers express their individual opinions in a very personal way, built on a joint vocabulary of maxims acquired in the process of participation in building e.g.:

One day you're going to have to make a decision as to what tops you're going to have to make, whether they be laid over, or pointed or half round or whatever, but you can make that decision when you have got copestones that are big, they're big so you can trim the top off so that you

can get them a nice finished top. But you will either stand them up on that slope or tap them downhill. But you will make a decision (Stephen, interview 6).

In summary, individuals work to common goal, but in many different ways.

21.2.6 The Relevance of Emotion

Dreyfus (2002a) suggests that emotion is an integral part of acquiring expertise. Damasio (2000) also stresses the importance of emotion in the human experience. From studies of music, we find reminders of the importance of emotion, and a reference to the importance to practising at different times of the day. Goleman's work on 'Emotional Intelligence' (1996) gives a detailed description of 'flow' and how it can be a motivational factor in learning. Polanyi's (1958) theoretical approach stresses the need for an emotional commitment to learning along with the need for tacit knowledge and the importance of 'knowing how'.

In this study, 'good days and bad days' are well evidenced, very openly. This shows the importance of our emotional state when we are learning. This is partly at the obvious level of description, and a common understanding that 'these things happen', but is also an ongoing discussion about how to respond to bad days and how to enjoy good days, for example:

Well the other thing, even for experts, is that you do have good days and bad days and so there are times when even you have to go back to thinking what the heck am I doing (Paul, interview 10).

Thus the understanding of the importance of emotion in learning is emphasised, both in the ebb and flow of the day itself, and in the 'sort of day' – for example:

When you say you're having a bad day – you know you're having a bad day and you either say 'Well, sod this, I'll stop and just walk away' - And knowing that, that's expertise. It's knowing that it's not working - walk away from it (Paul, interview 10).

This raises the question as to why it is very rarely referred to in many studies of learning. Laukenman *et al* (2003) state:

There have been few systematic studies [in natural science didactics] that concentrate on the relationship between emotional and cognitive factors in learning (p.490).

When wallers are learning their craft, the importance of emotion and its help or hindrance in getting to where you want to be is underlined. Understanding and accepting that emotion is an integral part of the activity is demonstrated. Wallers find it important to communicate this. In summary, the importance of emotion in learning dry stone walling is well evidenced, in contrast to many studies of learning.

21.2.7 The Use of 'Rules of Thumb' or Maxims

Polanyi's (1958) describes 'skilful performance depending on unknown rules'. He also points to the use of maxims, or 'rules of thumb' to communicate between experts. Dreyfus (2000) agrees, referring to "...authentic language only making sense to experts..." (p.308). Benner's (1984) work supports this. From studies of learning surgery (Malin *et al*, 2002) we find references to 'rules of thumb'. From

the literature on dry stone walling, there is reference to the existence of 'rules of thumb' or 'maxims'. Much of the material collected was summarised under heading expressed by maxims or rules of thumb. These maxims were used by all participants, at every level of learning, as instructions, as jokes, as things-that-need-to-be-known-and-followed, as ways of communicating. Eleven of these, described in chapters 5 – 15, stood out as being used very often. Polanyi's (1958) definition of maxims is graphically demonstrated. Dreyfus' (2002a) and Benner's (1984) ideas that maxims are only used at the highest levels of expertise is not borne out.

Dreyfus' (1992) and Benner's (1984) models have two aspects which are not borne out by this study. Firstly, the idea of 'rules for context-free elements' which the novice is supposed to learn or be taught. The importance of teaching rules can be seen in situations where the content may be written down or read about in textbooks, and where life-and-death practice risks have to be taken into account at an early stage, such as in medicine or nursing. However, these are not so easily seen in more practical situations, particularly in walling, where the activity is central and the risks of getting it wrong can be controlled relatively easily over a period of time. Even in nursing or medicine, however, there are no context-free elements and it is misleading to describe them as such.

This leads us on to our second theoretical difficulty, that of describing 'acquiring expertise' as a linear hierarchy which has distinctly identifiable stages. Again, it is tempting, post-hoc, to describe stages in this way, and where studies do take

place in classes where groups stay together as they study, it is easy to describe the general changes in levels of knowledge and in practice, as if they relate to individuals. This idea also makes it easier to deliver a curriculum and measure its outcomes. Every individual should go through apparently the same stages at the same time. This is obviously not true of individual learning. This linear developmental model also assumes that one stage of learning, associated with a style of behaviour, necessarily has to follow another. Again, this is not evidenced in this study. Wallers learn individually, some learning more quickly than others, some 'getting stuck' at different places from others. The variables of context, of material, of time taken, of individual genetic makeup, and of emotion, even of the time of day, contribute to the particular situation.

Because these maxims were so pervasive, used by all participants at every level of learning, as instructions, as jokes, as things-that-need-to-be-known-and-followed, as ways of communicating, they add an important aspect to our understanding about learning. Maxims are important in a number of different ways: as a way of communication, as a way of transmitting knowledge, but also a way of building knowledge. They are used in the process of doing the practice, and in other learning situations. They can hold almost magical properties in their summary knowledge. They are freely expressed, but as condensed knowledge, can be both codes that are for the expert, but also vehicles for the learner. In summary, maxims are a very important part of the learning process, in many more ways than has so far been described in the literature.

21.3 Summary of Findings

Some aspects of the literature on learning by doing, particularly those of Dreyfus (1972) and Benner (1984) were not supported by this part of the study. They suggest that the novice stage of learning is concerned with learning 'rules for context-free elements', whereas learning by doing is part of the learning process in all stages of learning, from the novice to the expert stage. The use of tacit knowledge is ever present in this study, contrary to some aspects of the theories of Dreyfus (1972) and Benner (1984). This study supports the existence of emotionally positive engagement with the task at many different stages of learning, which may be examples of 'flow'. Reflection, constant decision making and understanding and learning from mistakes are all essential parts of learning dry stone walling. This accords with some of the literature on reflection, but indicates that it is a more subtle, complex process than is expressed by Schön (1983, 1987).

In learning dry stone walling, individuals work to a common goal, but in many different ways. Although there is discussion of how long it takes, in terms of practice, to become an expert, there is no demonstration of a particular length of time necessary to achieve this. The notion of 'an expert' is contested in the literature. In dry stone walling, although within the DSWA there is a clear distinction made between those who work full-time in this activity and those who pursue it for a weekend activity, there is evidence that expertise can be learnt and acquired with practice, even by those who do not practise it as a full-time

occupation. The importance of emotion in learning dry stone walling is critical and well evidenced, in contrast to many studies of learning. The use of 'rules of thumb' or maxims is a crucial part of the learning process, from novice to expert, and in many more ways than are described in the literature.

21.3.1 What Happens When Wallers are Learning Their Craft?

How wallers learn does not fit simply into any of the seven themes. It is contextualised, complex and individual. It demonstrates tacit knowledge and intuition. It involves emotion, sometimes consciously, sometimes not. It involves reflection in many different ways. This is the contribution of this study to original knowledge.

Dreyfus' (1992) and Benner's (1984) models have two aspects which are not borne out by this study. Firstly, the idea of 'rules for context-free elements' which the novice is supposed to learn or be taught; these do not fit well in practical situations, particularly in walling, where the activity is central and the risks of getting it wrong can be controlled relatively easily over a period of time. The second theoretical difficulty is that of describing 'acquiring expertise' as a linear hierarchy with distinctive stages. It is suggested that this is a model for teaching, rather than learning, and that wallers learn individually, depending on a number of variables such as context, materials, individual genetic make up, emotion and the time of day.

The way wallers learn is in essence 'knowing how'. It is complex, involving individual decision making, the individual's brain and hand-eye co-ordination, and individual reflection. It also involves interactions between people, joint reflection and joint decision-making. There is a recognition at every stage of learning, that tacit knowledge or intuition is involved. Individual and subjective variations and experiences in learning are an accepted part of the process. The emotional state of mind of the individual clearly affects practice. 'Rules of thumb' or maxims are constantly used as a means of communication.

21.3.2 How is Expertise in Dry Stone Walling Acquired?

Much has been made of Schön's (1983, 1987) work on reflection, and it has, like Benner's work, been enthusiastically taken up in certain professions. Here however we find that although wallers do regularly reflect on their work, Schön's model of 'expert and student' is a hierarchical one focussed on teaching, rather than learning, which finds little resonance in this study.

Acquiring expertise in dry stone walling is neither simple nor linear. It is complex, but can be acquired through practice. Individual and subjective variations and experiences play a large part in this learning, which is why it is not possible to identify a linear series of stages through which learners pass, nor a particular time scale. Constant decision making, reflection and learning from mistakes are key elements in the process. A recognition of the importance of tacit knowledge or intuition is necessary in the process, that learning somehow 'sinks in' over a period of time. Snow (2001) suggests:

Building a wall is building faith in oneself. By getting through difficulties and working to satisfaction, I build slowly on small successes. Walling is an eventless occupation: all practice without performance (p.44).

It is acquired by observation, and imitation:

I feel comfortable [in doing it] because I've seen Steve doing it. (Chris, interview 3).

Emotion plays a key part in learning. In additions to 'good days and bad days', the whole range of emotions is expressed, from the frustrations of struggling with

an intractable problem such as finding the right stone:

How do you know it's the right stone? it fits - it's the bits either side of the right stone that's the pain in the arse... you know, you put one down there and it just fits. You can feel it, that's it, that's what its going to be. And then there is a gap of two inches each side (Michael, interview 3).

To the joys of 'getting it right', or an appreciation of the material:

Time flies when you're enjoying yourself. You look at your watch and think 'God - already' (Tony, interview 10).

You don't have to be right next to a wall to feel the stone,- you feel the stone even though its two miles away (Don (1), interview 2).

The importance of 'rules of thumb', both as a general concept, and the use of specific 'rules of thumb' cannot be underestimated in the acquisition of this expertise.

21.3.3 How do Wallers Communicate this Information?

A key element of communication of learning is by the use of 'rules of thumb' or 'maxims'. They could be best described as 'points of reference'. They are used as ways of communicating, ways of checking understanding, ways of

remembering, used by teacher and pupil alike, as ideas to think about, as important points to remember what you had to do, as ways of describing what needed to be done, as points in conversations to help rethink where you are in the process. The way of communicating them is also distinct; usually laconic, not instructional, sometimes amused or joking, always in short phrases.

Wallers communicate their learning whilst 'in practice'. Although there is some communication in DSWA meetings, this is usually confined to the business of the association, with an occasional 'slide show' to demonstrate a particular waller's expertise. 'In practice' means literally, by being involved in building a wall, wherever that is, and this is mostly dictated by geography, geology, and the needs of the farming community. Although the DSWA now has a training ground where walls can be built and then rebuilt, this is not commonly used. 'In practice' therefore means working individually and then reflecting jointly with others at a later stage, or working together with others, jointly sharing learning by demonstration, by copying, by discussion and further practice. It is this combination of all the elements of learning which is important, and the combination of all these elements is recognised in the communication:

In certain situations, you simply have to do different things.. like one over two, two over one, it's a sort of rule, but if you've got to a certain point where you've got a certain stone that has got to go in, then you're not going to be repeating that particular rule the whole time, you're simply going to be getting on with it (Don (1), interview 2).

The walling process in all its aspects, affects communication:

When things are going easy in the morning, there's a good selection of stone, you get involved, and then as the day progresses, if you are with a

partner, you go quiet because things are starting to get a bit more difficult and you are having to think a little bit more. (Stephen, interview 1).

The use of tacit knowledge or intuition is commonly accepted:

The old grey matter kicks in (Stephen, interview 1).

Reflection and learning from mistakes is communicated both during the time of work, and at regular periods in the day, usually at the end of the working day. Individual experiences and insights are shared at both these times.

21.4 Implications of the Study

Learning walling is a complex process, not easily summarized, as it involves the use of the brain, tacit knowledge, skilled hand-eye co-ordination, hard physical activity, understanding the part that emotion plays, much practice and the use of reflection so previous mistakes are not repeated. 'Rules of thumb' are a particularly important way of communicating this learning.

21.4.1 The Wider Implications for Learning a Skill

Understanding that the craft of walling involves such complexity begs the question as to why it and other crafts are often relegated to a status of 'merely' crafts. The fact that the monetary value of walling is mostly low should not lead us to underestimate its value in other ways. Although it is commonly seen in a romanticised fashion, this should not lead us to underestimate its potential for understanding learning in other areas. Brain and hand-eye co-ordination are widely valued in other spheres, for example, in sport. Although there are many

references to complexity in the area of sports studies, there is little understanding of how these complexities interrelate, other than at a physical level.

Although this study focuses on the particular practice of walling, there are wider implications for learning. Questions are raised about why the importance of emotion in learning is so underemphasised. The commonsense notion that we all have 'good and bad days' and that this affects our behaviour, points to the importance of understanding how emotion can affect all learning situations, not just those involving learning a craft. Walling produces a very obvious outcome, whether the practice is expert or not. The nature of the result enables students to reflect both whilst doing the work and at later stages. The nature of 'learning by doing', deeply involving the student in the process, results in learning that can be applied in different contexts. Walling as an activity cannot be reduced to the application of a set of simple rules. It does not lend itself to outcomes measured in this way.

Cooperation in the group setting is essential in walling, as the outcome is a joint one. Although walling can be a competitive activity, the need to work together on a joint piece of work successfully needs a group culture of teacher and students cooperating together, both in a joint plan, and in the practice. This is particularly emphasised when a physically difficult problem is encountered. It may need the efforts of several people to, for example, shift a particularly large footing. Wallhead and O'Sullivan (2005) in a study of the sports education curriculum, say:

Evidence suggests that sports education, with its emphasis on persistent team membership, promotes personal and social development in the form of student responsibility, cooperation and trust skills (p.181).

Although there is a significance to working together as a team, this study did not have a team with a regular membership, as several group members joined and left during the period of the study. This necessitated learning (and teaching) styles which accommodated and reinforced individual learning at levels which were comfortable to each student, who were at varying levels of skill. The approach was not a team approach, but necessarily a co-operative one. This approach supported individual students, but emphasized the group task of co-operation to a common goal. Maor (2000) studied teachers as learners. He found:

Teachers who participated as learners in the professional development program became familiar with a learning environment; understood the context, problems, and issues faced by students in the classroom; and were better able to facilitate students' needs (p.307)

This is borne out by this study. The emphasis on 'joint learning' was a positive for teacher and students alike.

Tacit knowledge theory suggests the importance of the use of 'rules of thumb' in communicating a skill. Attempts have been made in other areas of study to locate and make use of these (e.g. Malin *et al*, 2002). The pursuit of these 'maxims' in other areas of skill development may prove fruitful.

21.4.2 The Implications for Teaching

Understanding the nature of the individual and complex nature of learning leads us very directly to recognising the importance of the individualised nature of the teaching side of the equation. In formal teaching situations, learning will be enhanced by having many ways into a topic or problem, and by multiple opportunities to work through similar problems, using a range of teaching and learning media and techniques by which students can explore the chosen topic. Having a product or physical outcome to a learning situation allows reflection over time. Wallers value reflecting together in groups, usually at the end of the working day, on the job in hand. Setting out a process for joint reflection as part of other skill based teaching and learning programmes would seem to be of advantage.

The wallers in this study were 'learning how to learn'. If teaching focuses on this, successful students will be able to acquire deep knowledge and know how to apply it in different contexts. The culture of the learning group was one of 'learning from each other' and was a positively supportive context in which to learn. This reinforced the positive emotional elements and enhanced learning of how to cope with problems and 'bad days'. Having a common goal of building a wall together enhanced the co-operative nature of the practice.

Schelfhout *et al* (2004) studied self assessment, peer assessment, and teacher assessment as a feedback system. They found that:

There will need to be a balance between, on the one hand giving students enough freedom for self-discovery and self-regulation, and on the other

hand steering the students in such a way that certain problems can be avoided and that every student can get optimal learning chances (p.177).

Although this stresses the balance necessary in all teaching situations, it suggests also the importance of peer review of learning. As students acquire expertise in dry stone walling, they can and do become peer mentors, and classes can be organised in this way, with more experienced students 'paired up' with less experienced ones. Providing the co-operative nature of the task is emphasised, this can be helpful.

21.4.3 The Implications for the DSWA

This study suggests that learning walling is complex 'learning by doing' that cannot be reduced to the application of a simple set of rules. This knowledge is clearly embedded in the Association's 'Craftsman' Scheme, which emphasises practice, learning over time, reflection and assessment of results by peers and experts. There is difficulty in fitting this approach to an externally assessed rule-based standard such as the LANTRA standard. They are not easily compatible. The association must be congratulated in achieving this balance between the Craftsman Scheme and the LANTRA standard. The business necessity of continuing to link with rule-based systems of assessment will continue. The tension between the two needs to be understood and the current balance maintained. In addition, the association and its members occasionally take part in activities which involve group learning, group support, problem solving, the emotional aspects of learning and the therapeutic effects of an activity in which

brain, hand-eye co-ordination, physical exertion and emotion are all fully engaged. These aspects of the craft could be emphasised much more systematically in the association's activities.

Dry stone walls are old forms full of new ideas (Snow, 2001, p.53).

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Appendix 1

The current situation of the Dry Stone Walling Association

A Presentation by Richard Love, DSWA Chairman, to the Otley Branch of the Association. May 2005.

There are: 19 branches

1500 members in all categories and the membership is growing. Of the total membership,

There are 20 corporate members

270 professional members and 10 junior members

1200 open members

2 employees

The aims of the Association are:

to promote the craft in as many different ways as possible

by national and local shows, community events, training courses and practice days.

The Association has a professional register, and publishes a range of leaflets and booklets can be located at

http://www.dswa.org.uk/Publication_frames_page.htm

The Association sponsors/awards particular pieces of work by way of the 'Pinnacle award' and the Ronnie Ball (junior) award

The Association also has fund raising activities: in training and testing by:

Taster days, weekend courses, and specialist courses

Funded training nationally comes via CCS/LANTRA

The association ensures its standards are maintained by examiner assessment and examiner standardisation every two years

The Association supplies additional support and training in:-

Instructor training, business management, health and safety, first aid and geology.

There are now new courses for clients and inspectors

The Association's future plan is to

Become more professional; get a proper permanent base/HQ at Crooklands or elsewhere

This new base should have exhibits inside and outside, a training and test site, and a place for events and meetings.

In order to do this, the Association needs to:

Get Branches and national Association to work together, and specifically have a fund raising strategy

We need to: act locally but think nationally employ a fundraiser, work to raise the number of corporate members

This means raising the public profile and making better links with other groups.

The way the Association will raise its profile is by:-

Government/lottery funding, environmental charities, and targeting general publicity on radio/TV,

Developing Stickers/ sweat shirts/key rings,

Talks to clubs/groups, and

by better linking with the National trust, NTS, and BTCV.

The Association needs to develop instructors/examiners, and make more use of them.

Appendix 2

Merits and Drawbacks of dry stone walls

(From Rainsford-Hannay, 1957)

Merits

- 1 They are durable. Many have stood for 200 years, and look like standing for another century
- 2 They are stock-proof against all stock except for the black-faced sheep. If 5 feet 3 inches high, they are stock proof against these
- 3 They occupy very little ground, 34 inches at the base at most
- 4 they give shelter at all seasons
- 5 They stand on ground where no post can be driven and where no hedge can grow
- 6 they are cheaply maintained
- 7 They drain themselves
- 8 They can be surmounted by any careful person, without damage to the dyke or to the clothes of the climber
- 9 They require no imported material
- 10 They require few tools: a 4-pound hammer, a rough frame, a good piece of string and a foot rule meet all requirements
- 11 They cannot be burnt.

Drawbacks

- 1 They take time to build. One man can build little more than six yards of four and a half foot wall in a day. In limestone districts, such as the Cotswolds, and the High Peak of Derbyshire, seven yards a day is the average
 - 2 Clumsy walling will dislodge top-stones. The remedy is to put in a stile or wicket where people are wont to cross
 - 3 Trees swing in the wind and their roots will weaken the dyke. These trees are generally ash or sycamore trees, self sown. The remedy is obvious
 - 4 Inquisitive or bored horses out a grass, especially at gateways, are apt to nose off top-stones. A bit of barbed wire, judiciously placed, is a preventative
- Where a dyke borders a road on an embankment, small boys find it great fun to roll off the top-stones from the cope down the slope. Various remedies suggest themselves, starting with the small boy himself.

Appendix 3

Four principles to understand why one stone is needed and not another

From Snow (2001), p.32

1

'End in end out'

Run the longest dimension of each stone into the wall. In that way the wall's weight presses on the greatest surface area of each stone

2

Cross the joints. Stones are set on the wall 'one over two, two over one'. Mutual gripping occurs when each stone touches two above it, two below it, and two beside it. Each stone touches as many stones as possible

3

Keep the middle full. In order to prevent slippage or settling because of internal hollows, keep the wall firmly and fully stuffed. Fillings are not thrown or shovelled in. The two wall faces are built up, keeping pace with each other and 'hearting' is added carefully and consistently. Some wallers refer to this as 'keeping my heart up'

4

Taper as you go up. As the wall increases in height, the waller decreases its width by setting the external faces of each course slightly more toward the centre. 'Batter' directs pressure inward and centralises the weight of the wall.

Managing the work, five techniques to help, and the 'Old-timers expression of the principle of efficient use of your effort'

From Gardner (2001), p. 110.

Five Techniques

Pick the stone for the spot, not the spot for the stone

Try to train yourself to remember more than one available space

Move on if your work area temporarily defeats you

Aim for steadiness rather than speed

Avoid needless force

Old timers expressions

'Don't pick up any stone that you don't lay in the wall'

'Handle each stone but once'

'A hole for every stone, a stone for every hole'

'What you lift, you build'

Building a wall with field-stones

Twenty points to remember

From Shadmon, (1989) p.108.

1. The best flat face of the narrow dimension of each stone should be facing outwards
2. Each stone should be embedded solidly on the stones below
3. A protrusion should be clipped off a stone, rather than trimming the stone by hitting it with small rocks and wedges
4. Small stones used in the outer faces may work loose in time
5. The thickest and heaviest rocks should be kept for the lower courses to avoid unnecessary lifting
6. Joints between stones should not extend from course to course to form a run, or else the wall will fold, as dynamic stresses concentrate at the weaker point
7. Every 2 to 3 m, a long tie-stone should be put in to tie one face to another
8. Rectangular stones of even thickness, the longer the better, should be saved for ends and corners, especially outside edges.
9. The higher the wall, the wider and deeper the footings
10. The top face of each stone should have a slight downward slant on which the next course can rest
11. Splinters and wedge-shaped stones should be added to the main stones to keep them stable.
12. Wedge-shaped stones should be placed with the widest end in the core of the wall and the thin edge pointing out
13. If built on an incline, a ditch on the upper slope of the wall and also a hole or culvert in the first above-ground course will permit drainage
14. Batter is required for retaining walls, especially for the backward slope, the angle increasing with the height required. A rubble filling between the wall and the earth bank will enable water to flow freely behind the wall and prevent a build-up of pressure at any point

15. A lattice fence should consist of alternate squarish blocks and thin slabs, with a support block where the slabs in the course above meet

16 Gaps can be built at an angle to keep out cattle

17. Stiles should be planned beforehand with rises of about 20 cm and the same distance forward per step

18. The bottom of the stakes should be buried well below ground level

19. Gates or door hangers should be fixed into the facing ends of the opening by drilling holes with a hammer and chisel, preferably with the stone in a horizontal position

20. Stones should be dropped into place rather than put down so that they will find their own level.

Appendix 4

What experts are said to do well (Hollyoak, 1991)

Experts perform complex tasks in their domain much more accurately than do novices

Experts solve problems in their domains with greater ease than do novices

Expertise develops from knowledge initially acquired by weak methods such as means-ends analysis

Expertise is based on the automatic evocation of actions by conditions

Experts have superior memory for information related to their domains

Experts are better at perceiving patterns among task-related cues

Expert problem solvers search forward from given information rather than backward from goals

One's degree of expertise increases steadily with practice

Learning requires specific goals and clear feedback

Expertise is highly domain specific

Teaching expert rules results in expertise

Performances of experts can be predicted accurately from knowledge of the rules they claim to use.

Appendix 5

WALLING CLASS - Interview 4 - Saturday, 9 October 2004

Conversation with Chris

Q We're now on Saturday, October 9th. The weather is better than last week.

A It needed to be, didn't it?

Q Paul is paying by credit card. Such is life with walling. He's forgotten his cash – he's lost his money. Can a man who loses his money build walls – well, we've got to ask the question?

A And his dinner.

Q And his dinner. You've left your dinner? It's one of those days.

A You're higher up than me.

Q I am higher up than you, Chris. Well, I see. I mean I put mine up because I thought we were putting throughs on. You've put it over where the throughs should be. I mean, that's literally over that through on that side. Is that over that through on this side? No, it's under the through.

A Do you want me to do it again.

Q Yes, yes.

We're putting the first course of throughs on a limestone wall at about a third of the way up, that's about 18'.

Conversation with Michael

Q We're talking about lines now, using tatty old lines. That pin in the wall is still too far out, isn't it?

We're just talking about pins and getting them in the right place. So Michael is now using a large pin to hold the line against the wall.

A Can you see what's happening? Keep an eye on that. You may have to alter that line. But every course you come to, you may have to pull it out. So if you can, pull these this way a little bit to give yourself that width.

Q Take some stones out at course four. You need to pull that out about an inch. Yes, that needs to come out.

A It's always difficult tying into other people's work.

Q Especially when they've made it too narrow.

A Yes, but they haven't.

Q So we're now talking about random limestone and actually only putting the lines up twice – one's under the first throughs and one's under the second throughs. Then one's to get it to the top line.

A Yes, rather than lifting it every course or every alternate course.

Q Yes.

A Line on foundation, line on for first through, line on for second through, a line on then for your finished height and even then that line on for the finished height could have to be altered depending on what stone you've got left. Every stone that comes off the wall must really go back on.

Q OK. Fine.

I'm going to go down and see who's down there now.

Conversation with Paul

I've come to talk to Paul, now.

Is it going well this morning, Paul?

A Yes, I've warmed up a bit now. Brain's functioning a little bit better.

Q Tell me why it's going well then.

A It's going well because I've over faced myself by taking down about 4 metres. I'm just hoping Steven isn't wanting to get it all up today.

Q I don't think so, no chance.

You've even got a couple of nice pieces of slate in there.

A Yes, just a couple. I've just broken a nice stone over there by chucking that over there.

Apparently this has been re-built.

Q Yes, you can see, can't you?

A And this is where the wiggle stops. I'm just going to straighten it out.

Q The wiggle is about a 3ft wiggle.

A In fact, it's almost S-shaped, isn't it, because it comes out and goes back in.

Q So you're having a good morning this morning, Paul?

A Yes, I've warmed up now as well.

(different voice – Tony)

In fact it was feeling a little bit on the cold side to start with.

Conversation with Walter

Q Well we've got a nice section of wall here. Are you all into any rules, do you think?

A We're walling to Mr Harrison's rules.

Q Well what are Mr Harrison's rules do we think?

A Where would you like me to start?

Q I don't mind, I've got 40 minutes tape here.

A You've to put the largest stones in on the base and where the land falls away, then we put a broader a - what's it called David – a scarsement.

Conversation with David

Q Scarsement – we spent ages trying to get him to spell it. SCARS, I think. Or scarsement with a SCARC – we're never quite sure. But I think it means a step. I can't find it in any dictionary – we've tried.

A It's probably escarpment.

Q Yes, It is – I think you're absolutely right. In fact, that's interesting.

A That's got a 'p' in it, though, hasn't it?

Q All the same, it might be the same step. You're the first person I've heard who's made anything like a comment that works. Escarpment.

Conversation with Nick

Q So you're putting the big ones in the bottom?

A That's right. And we fill up with fillings, I suppose, as we go up. And every now and again we put what we call a through into it which binds the wall together. Unfortunately we haven't been given many throughs. They're scarce are throughs. Well, we're given obviously what we pull down. We just simply pull it down and build it back up as best we can.

Q So you've taken these out today and you're putting them all back?

A That's right, yes.

Q Big ones in the bottom.

A A daft occupation!

Q Pardon. A daft occupation – it's a wonderful occupation.

A It's a hobby, for me anyway. So far anyway. I'm not sure whether I shall ever be good enough to make any money on it.

Q A few years on.

A It's something I've wanted to do since I left school and I left school about 40 years since and I did about two days just before I left school - in the playing fields, and I thought I like this and I've never had an opportunity since, so here we are.

Q I don't know why it fascinates people so much. It obviously does occupy people.

A Well people generally. When you find people like Terry coming up all the way from Eastbourne, it's incredible.

Q He ran out of benefits money at the time. No, he didn't run out, they messed his benefits up, that's why he couldn't get here. When he gets his money back again, he'll be on his way back no doubt.

OK, I'll leave you guys to it.

Conversation with Paul

Q Paul, are you alright up there? Are you having fun?

Paul's putting some footings in – some very large foot by foot footings, and it's beginning to rain, which is a delight.

A It's my third Saturday and it's the second job really, isn't it? We did a stint up there and now we've moved down, and each time I always feel everyone else's stones are better than mine.

Conversation with David and Michael

(different voice) Not this time.

Q Not this time.

A Walter's got a solution for that.

What's that – nick them?

Not when Terry's here though.

Q Walter's solution is nicking them, is it? Right?

A It's a vicious rumour.

Q It's a vicious rumour that Walter pinches stone. It's one that we've been creating for years.

I'll stop for a bit.

That last section with Paul was also with David and Michael.

Conversation with Walter

Q I shall talk to Walter for a bit, then.

Is that the right stone, Walter?

A No. I've just moved it along. I had intended to use it in there but I couldn't so I just pushed it along a bit. This is a problem wall.

Q Is it, Walter?

A The shape of the stone, the unevenness, but I haven't got it all that vertical. There's one there.

Q It's a very difficult shape is that one.

A Yes.

Q It's a large stone which has no proper face on it or it's smashed away on the gatepost side.

A I've got it up now. I'm going to add one more on top of there.

Q Height of this – the wall head.

A To the top of the copes.

Q Yes. So are you having a good day, Walter?

A Yes, I'm having a good day. I've done quite well today.

Q What have you done today?

A Well, the problem is I can't tell you now because I didn't note where I started this morning.

Q But you know you're doing well?

A I must have gone from there, I suppose, both sides.

Q So, three or four large courses, couple of metres length, one through.

A One through, which is the only one I've got in this stint. Quite like the stone, for instance, because it's very workable. Although it's limestone, it dresses nicely. You can hit it and reasonably expect to get a result.

Q Excellent, Walter. I shall come back later.

That's the end of 9th October. It's 4.00pm. Fencing up. Paul trying to kill everybody with various implements and a sledge hammer. Start again next week.

Appendix 6

The interviews, the wallers involved in the interviews, and their experience.

The first two interviews were individual interviews which took place in June 2000 and April 2001. The first respondent, (Stephen) was a master craftsman, and the second (Don), a keen amateur waller from a local DSWA branch. Both respondents were keen practitioners, and had heard me speak about my research, and wanted to participate.

Because of the break in research due to foot-and mouth disease, the later interviews started in 2004. Most of these were recorded in 'learning situation' of a further education class supported by a local College. These were interviews or conversations of varying lengths, from an hour to two hours overall, which were recorded whilst the group were involved in building walls in various locations. The number of participants in each conversation varied, depending on the attendance of the participants in the class.

Interviews 3-7 took place in the period September – December 2004.

Interviews 8-16 took place in the period March – June 2005.

Interview 17 took place in September 2005.

These 17 interviews involved a total of 23 respondents of varying experience. The descriptions of the experience of the respondents refer to the amount of experience and practice they had at the beginning of 2004. As the interviews went on, the experience of the respondents increased, but at a varying rate. Those respondents who were keen and intending to take up walling as a full-time

occupation, (such as Paul) put in much more practice time between the interviews than others, (such as Denis) who came for a few classes, then left, having achieved what he set out to do. Thus some interviewees appear in only a few interviews and some (for example, Stephen) in many.

Waller involved in the interviews

Alec. Joiner, woodwork teacher. Came to learn walling because he needed to rebuild the walls around his property. Odd job man in a local village. 3 years experience recreational walling.

Andy. 30 years experience, Professional, Master Craftsman.

Ann. Professional Choreographer. Also a professional Waller with 10 years experience. Passed her Initial certificate in the 1990s.

Chris. Several years experience recreational walling. Runs his own business.

Stephen, 40 years experience. Started walling at age 12 as a schoolboy, achieved Master Craftsman certificate in his early 20s, was at one time known as 'number 5 in the country' Professional, student, Master Craftsman.

David.(1) Retired Veterinary Pathologist. No previous experience. Needed to learn walling to be able to maintain his own property.

David. (2) Retired salesman for a company exporting conveyor belting. A recreational waller with no previous experience, but 'hoping for excellence'.

Denis. No previous experience. Employed in local government in mental welfare work. Wanted to learn walling to rebuild walls around his own property.

Don. (1) retired engineer, with 10 years experience. Supported several weekend courses over the study period. Passed initial stage walling exam in 1990. Now cannot wall due to ill-health. Regular attendee at local DSWA meetings.

Don (2). Works with the local millennium project. No previous experience.

Graham. No previous experience. Works in pest control for a local Council.

John. Butcher, gardener, no previous experience of walling. Suggests 'personal reasons' for enjoying walling.

Margaret. Retired social worker. No previous experience. Wanted to learn walling to rebuild walls round her own property, to where she had moved recently.

Michael.(1) Retired. No previous experience of walling. Used to be a salesman for Rowntree-Mackintosh. When first retired, ran a guest house. Wanted to learn walling to be able to restore walls on his own property.

Michael. (2) A retired industrial chemist, who now has his own smallholding. A small amount of previous recreational experience

Nick. Retired. Works as a volunteer ranger for the National Trust. No previous experience of walling.

Paul. In his 20s, tall, physically extremely well built. No previous experience. Was a technical salesman for a chemical company. Started walling as a change of career to become a full-time waller.

Peter. Recreational waller with little very little experience. Well- travelled, works in the oil industry. Wanted to learn walling because of the need to rebuild his own garden walls.

Sebastian. Started attending walling classes in the 1990s. Started walling out of 'general interest'. Now has 10 years experience of recreational walling. Passed his Initial Certificate in 2002.

Terry. Commuted from Southampton weekly to be part of a walling class: originally had no experience. During the period of the interviews, moved to the local area and works for a local Conservation Trust.

Tim. A small amount of previous experience walling as a recreation. Works as a labourer for a local landowner.

Tony. Worked for a local Council in the Highways Department. No previous experience, except a small amount of recreational walling. During the course of the interviews, moved house to the Dales to be nearer dry stone walling country. Still works for the local council and does paid walling jobs at weekends.

Walter. Retired industrial organic chemist. Ten years experience in walling as a recreation. Came to walling from being a countryside conservation enthusiast. . Achieved his Initial Walling Certificate in 2002.