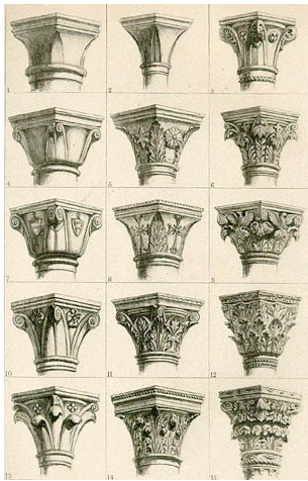


## 5 Craft knowledge

*“... in all things that we see or do we are to desire perfection and strive for it, we are nevertheless not to set the meaner thing in its narrow accomplishment above the nobler thing in its mighty progress ... not to prefer mean victory to honourable defeat; not to lower the level of our aim, that we may the more surely enjoy the complacency of success.”*

John Ruskin *The Nature of Gothic* (1853 p84)

### 5.1 Introduction



*Figure 61: Ruskin's Gothic capitals.*

In this chapter I describe the development of a framework for understanding the learning of craft skills drawing on the theories of John Dewey, Michael Polanyi and Donald Schön and validated through reappraisal of the practical work described in chapters 3 and 4.

I start by describing the decline and revival of clog making skills, a story that was initially related during the elicitation described in the previous chapter and then validated through further investigation into the literature on the craft. This demonstrated the difficulty in resurrecting such crafts without the critical appraisal of the wider community of practice.

I then provide a contextual review of literature, firstly setting the historical background for the revival of interest in traditional crafts and then considering literature on the tacit nature of craft knowledge and its means of transmission. I use this to reappraise the practical work undertaken with the bowl turners and clog makers and gain a deeper understanding of the ways in which craft skills can be learnt.

I conclude with a speculative framework for understanding craft skills learning, based on explicit concepts being used to bridge the gap in personal knowledge between a novice and an expert, and on reciprocal reflection as the means by which novice and expert refine their

communication. I also consider in greater depth the role of reflection for the self-directed learner and its influence on the path their learning might take.

## 5.2 Clog making skills

### 5.2.1 Introduction

In this section I plot the decline and revival of clog making skills. A by-product of the recordings described in the previous chapter were biographies of two other Welsh clog makers and implied differences in relative skill levels. As this material was largely anecdotal, I undertook some wider research into the history of clog making to gain a better understanding of how these people learned their skills.

Whilst the industrial revolution led to a high demand for clogs, the resultant increasing mechanisation of the process led to a gradual erosion of both the design of the product and the hand craft skills which only remained in isolated areas. The influx of 'hippies' into rural Wales in the 1970's stimulated a new demand for clogs and through research and experimentation Jeremy Atkinson was able to trace the original skill back and revive it.

The resultant picture this created of the last remnants of this once-ubiquitous craft resulted in my speculating on the nature of such learning which creates the remainder of this chapter.

### 5.2.2 Biographies

#### 5.2.2.1 Thomas James



*Figure 62: Thomas James.*

Thomas James was born in the early 1890s and learned the skill by becoming apprenticed to a local clog maker in his early teens. He was well into his 70s before he fully retired and into his 90s when he died. A series of photos taken in 1961 are held in the archive at the Museum of Welsh Life and also appear in *Traditional Country Craftsmen* (Jenkins 1965). The museum also has a short film of him working produced by HTV in 1963.

Atkinson thought he was the last traditional Welsh clog maker: the last to both hand carve the soles from unseasoned sycamore and make the uppers from waxed kip leather. He had first visited James' workshop in 1980 at which time James apologised for no longer being fit enough to

show Atkinson what he did but allowed him to look around his workshop. Atkinson visited again after James' death and bought some tools from his son who had not continued the tradition.

### 5.2.2.2 Trevor Edwards

The history of how Trevor Edwards learned clog making was not entirely clear, but Atkinson thought he was in his 20s when he learned, having found a retired craftsman who was prepared to teach him. He had not served a traditional apprenticeship, only learning to hand carve the soles from alder and buying in ready-stitched uppers to complete the clogs. Edwards taught Atkinson to make clog soles in the late 1970s, firstly informally, then for 6 months on a government-funded scheme. After he retired he continued to demonstrate his craft occasionally and also provided some tuition to Parfitt (see below).



*Figure 63: Jeremy Atkinson.*

### 5.2.2.3 Jeremy Atkinson

Jeremy Atkinson described his early training as "ten months faffing about and six months training" at Edwards' workshop in the late 1970s. He had previously been undertaking teacher training, but had dropped out and wanted to "do something with his hands". He claimed to have chosen clog making as a craft because Edwards was the first craft practitioner he found who would take him on as an apprentice [JA4 t1.09].

He produces finely finished clogs with hand carved sycamore soles and hand made leather uppers. At the time of interview, he was undertaking most of his clog making whilst demonstrating at craft fairs during the spring and summer months, spending the autumn and winter months undertaking freelance footpath survey work.

He had attempted to teach his craft to several different people over the last 20 years, but had not felt any showed the talent or perseverance to succeed. None followed him into professional practice. Parfitt was the first novice he felt demonstrated the potential to make a successful clog maker and Atkinson provided him with tuition at the Museum of Welsh Life for a total of three weeks in 2/3-day periods during July/August 2005.



*Figure 64: Geraint Parfitt.*

#### **5.2.2.4 Geraint Parfitt**

Geraint Parfitt had been employed as a room steward at the Museum of Welsh Life, Cardiff, when he became interested in clogs after exploring the archive material held there. In his spare time he started to learn the craft from Edwards who had retired from full-time making, spending a total of about two months with Edwards over a four year period, supported by practicing on his own when he had spare time.

Edwards put him in touch with Atkinson, perhaps prompted by incidents such as the one described below, and Parfitt started spending his free time with Atkinson instead. He then persuaded the museum's management to find funding for Atkinson to help him advance his skills during summer 2005. The museum subsequently promoted Parfitt to craft demonstrator at the beginning of 2006 and he had set up a workshop at the museum which was open to the public.

#### **5.2.3 Considering the evidence**

Emerging from these profiles was an implied difference in skill levels of the three 'master craftsmen': James, Edwards and Atkinson. Atkinson was of the opinion that Edwards had degraded the craft and his own work had both restored it to James' level and additionally progressed beyond that.

Whilst this was Atkinson's subjective opinion it was partially substantiated by Parfitt who, prior to meeting Atkinson, was also not impressed by the quality of Edwards' work or his teaching, as illustrated by his relation of the following incident:

*I was working over at Tannoy ... in the workshop there and [Edwards] was training me. He went off for lunch and I'd started a sole and he said, "Finish it by the time I come back." ... So I went rummaging around and found one of the soles that he'd finished and I gave it to him and I said, "What do you think of this?" "Aye," he said. "It's not very good see, 'cos ..." this, that and the other. However it was one of his own soles he'd cut. He couldn't tell and I said, "That's one of yours mate." I don't think he ever forgave me for that!*

Geraint interview 1.8.05 [event log JA3.2 t1.13]

These judgements of the relative skills of James and Edwards were verified by further research into the major criticism they had of Edwards' clogs, the shape of the sole. A wooden sole will not bend as the wearer walks so it must be curved to roll with the foot. This curve is known as the spring and the point at which it starts is critical. If it is too far behind the ball of the foot the wearer will not be able to stand still, or as an old clogger commented "a chap would be always rocking like" (Hartley 1939). If the spring is too far in front of the ball of the foot, the wearer will have to lever the clogs forwards as they walk causing their heels to ride up and down in the back of the clogs causing discomfort.



Figure 65: My own clogs made by Atkinson.

Atkinson recommended starting the spring just behind the ball of the foot, as illustrated in Parfitt's notebook below, and my experience of walking in the clogs he made for me was that this did enable my heels to remain in contact with the soles of the clogs for most of my stride. The clogs I was shown that had been made by Edwards, and those made by Parfitt under Edwards' tutorage, were quite flat in profile and the spring started after the ball of the foot. Whilst none of James' clogs were available to view, Atkinson had some photographs of soles cut by him and I found several more in books. Close inspection revealed that, whilst they were much less curved than Atkinson's, the start of the spring was clearly behind the ball of the foot (see Figure 66).



Figure 66 Above: clog sole drawing from Parfitt's notebook. Right: soles made by (from top) Atkinson, Edwards and James showing start of spring (S) and ball of foot (B).

An additional internet search for images of old, hand carved clogs produced five more examples, all of which appeared to confirm Atkinson's rule of starting the spring just behind the ball of the foot:



*Figure 67: Clogs with hand cut soles from Hawes C20th (top l), Wrexham C19th (top r), Scotland C19th (centre), Dumfries 1943 (bottom l), Scotland 1936 (bottom r).*

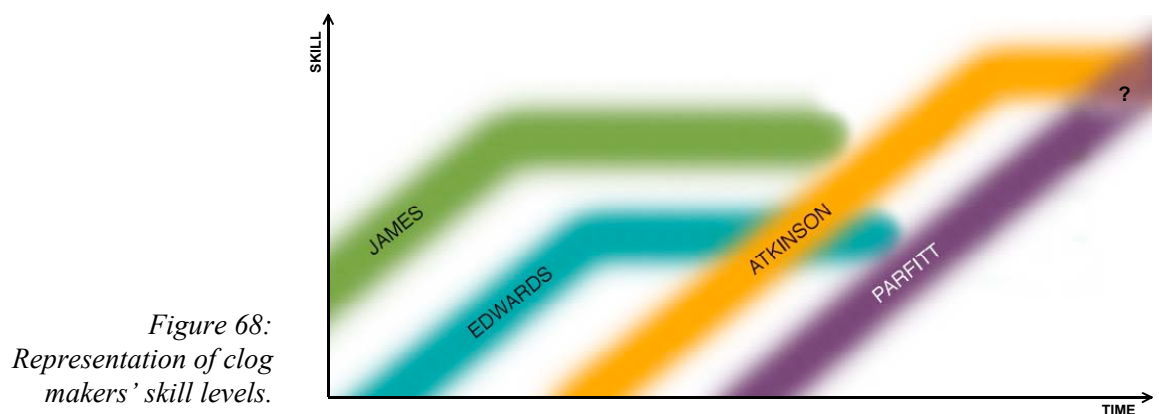
#### 5.2.4 Conclusion

In the 1927 government survey of rural 'industries', Jones plotted the start of the decline of clog making skills (Jones 1927). The industrial revolution had generated a huge demand for clogs and a gradual mechanisation of their production. Firstly came the blockers who rough cut alder or birch soles in the woods and transported them to urban areas where the final shaping was undertaken in large workshops employing huge numbers of makers. Then the factories took over, machine cutting the soles from beech planks because they were cheap and uniform. These planks clearly became thinner and the soles flatter for economy. The traditional hand cutters who made individual clogs for people they knew and had skills passed down the generations existed only in small numbers in remote rural areas, particularly West Wales. However, through increased communication and transport of goods these clog makers were also coming into competition with clog manufacturers and with shoemakers as shoes became cheaper and clogs become associated with poverty. They too were starting to economise and buy in ready-made soles, uppers or both and put the two together.

I would speculate that James represented the end of the hand carving tradition: one of the last of the makers who had learned through informal apprenticeship and followed the profession all his life.

Following the decline described above, Edwards appears to have learned to manipulate the tools but not the importance of the form of the clog to its function. Ten years later Atkinson was able to revive the craft through contact with the last remaining skilled craftsmen who remained in rural areas of Wales and Northern England and much experimentation. Perpetuation of the craft is still uncertain with Atkinson having only passed his skills onto Parfitt although, with the Museum of Welsh Life's support, he should have a good chance of continued practice and possibly the opportunity in time to teach.

Figure 68, below, provides a representation of the development of clog makers' skills over time. This is not intended as a measurable graph, but more as a visual aid to perceiving the relative skills of craftsmen described above.



In the next section I shall speculate on factors influencing the growth of a practitioner's skill, reasons for skills levelling off and likely causes of novice practitioners 'breaking through' the skill levels of their masters.

## 5.3 Contextualising craft knowledge

### 5.3.1 Introduction

In this section I present a brief historical context to the revival of interest in traditional craft skills starting with John Ruskin and the resultant arts and crafts movement. Whilst this degenerated into an argument that hand-made was good and machine-made bad, David Pye returned the focus to Ruskin's original concept, the mind-set of craftsman.

I then consider the theories of Michael Polanyi, John Dewey and Donald Schön, providing insight into the personal nature of craft knowledge. I discuss the ways in which it can be learned, considering the function of experiential learning and reflection, and taught, considering the role of received wisdom.

This is used in the subsequent section as a means of understanding the craft learning observed with the bowl turners and clog makers in the practical work.

### 5.3.2 Craft literature context

Perhaps the best known of John Ruskin's writings on architecture has the full title "On the nature of Gothic Architecture: and herein of the true functions of the workman in art" (1853). His argument was that the true beauty of Gothic architecture could only be understood through understanding the mindset of the craftsmen who produced it. What made Gothic architecture stand out from more modern architecture to Ruskin was its freedom of form which he felt came about through the freedom of thought and action allowed to the workmen. This freedom enabled Medieval craftsmen to take risks which might generate imperfections, but also allowed a speed and fluidity of work which created what he considered to be spiritually uplifting architecture. He called upon craftsmen to "do what you can, and confess frankly what you are unable to do; neither let your effort be shortened for fear of failure, nor your confession silenced for fear of

shame" (Ruskin 1853 p83).

Ruskin's writings inspired the Arts and Crafts Movement and in particular William Morris who did much to promote craft skills and products, seeking to restore the life of working men and women through reviving an interest in traditional crafts. He condemned the increasing separation of 'art' and 'craft', with the latter becoming mere manual labour to the detriment of the craftsmen whose "working lives have been one long tragedy of hope and fear, joy and trouble" (Morris 1877 p238)<sup>29</sup>. At that time, Morris's utopia of the working classes employed hand making beautiful domestic objects that they could also beautify their homes with was unreasonably idealistic: in the social conditions of the period only the affluent classes bought such hand made goods.

Nearly 100 years later in *The Nature and Art of Workmanship*, David Pye reflected on the increasing degradation of the argument into a promotion of hand-made over machine-made work and argued for a return to Ruskin's original concept: "The intrinsic importance of these ideas is not diminished by the fact that so much rubbish has derived from illegitimate extensions of them" (Pye 1968 p70). He sought to establish an understanding of craft skill based on the likelihood of actions undertaken by the workmen having a negative impact on the quality of what was being produced. At one end of the spectrum was the workmanship of risk that was "using any kind of technique or apparatus, in which the quality of the result is not predetermined, but depends on the judgement, dexterity and care with which the maker exercises as he works." At the other end was the workmanship of certainty where "the quality of the result is exactly predetermined before a single saleable thing is made" (ibid p4). Pye promoted modernisation of the craft process by moving the focus of attention away from the hands of the craft practitioner towards the head. The use of machines became 'permitted' in Pye's definition providing it was intelligent use involving personal management of the inherent risks.

<sup>29</sup> The debate regarding the divide between art and craft continues to this day, for example on the Craft Research blog [on-line], and whilst of interest to me I feel it is not directly relevant to this research which is focussed on skills rather than the resultant artefacts.

### 5.3.3 Tacit knowledge

Both William Morris and Christopher Alexander suggested that the risk management associated with craft skill was not necessarily a conscious process. Morris, in a lecture on the 'lesser arts' (1877 p241), referred to traditional craft skill as "the art of unconscious intelligence" and Alexander referred to such work as "the products of an unselfconscious culture" (1964 p33). However, Michael Polanyi provided the greatest insight into the nature of the knowledge that governed such craft practices.

Polanyi sought to challenge the perception of scientific knowledge as an exact, impersonal entity through drawing parallels with more creative professions and seeking an understanding of the knowledge that governed them. In the book *Personal Knowledge* (1958), he proposed that any expression of knowledge was greatly influenced by a complex range of knowledge possessed by the person in the act of knowing. He suggested that, whilst explicit rules or formulae might influence a skilful performance, it was actually the performer's wider personal knowledge that played the largest role in guiding the performance. He observed that much of this knowledge was so internalised and interwoven it was not possible to express: "we can know more than we can tell" (Polanyi 1966 p4) and such knowledge became widely known as tacit knowledge.

On a purely functional level, tacit knowledge could be seen as offering advantage to the craft practitioner by reducing cognitive load, freeing the mind from one level of a task to enable thought to be directed at another. Polanyi (1958 p55) referred to this as "two kinds of awareness": focal awareness and subsidiary awareness. On a simplistic level he illustrated the point with the example of hitting a nail into a piece of wood. The actor's hand is in direct contact with the tool handle, but there is only a subsidiary awareness of this and the focal awareness is on the impact between the end of the hammer and the nail. The person hammering is able to tacitly adjust the speed and direction of the hammer blows whilst concentrating attention on the nail entering the wood.

In *The Tacit Dimension*, Polanyi advanced this concept to two terms of

tacit knowing, the proximal and the distal. He described the functional relationship between these terms as knowing the proximal only by relying on our awareness of it for attending to the distal (Polanyi 1966 p10). We only know the whole of the theory that governs how we adjust the blows of the hammer by relying on it whilst in the act of driving the nail into the wood. This is why craft practitioners have difficulty describing the theory that governs their actions, they only know it through attending to their practice. He further described the phenomenal structure of tacit knowing as that we attend from the proximal to the distal: we attend *from* the theory *to* things seen in its light, hence theory could only be learned through practising its use, a process he called interiorisation (ibid p17).

Polanyi also considered the reverse of this process, where the focus of the practitioner’s attention was returned to the theory. The immediate result of the action becoming proximal and the theory distal was often a complete loss of meaning; “By concentrating attention on his fingers, a pianist can temporarily paralyse his movement” (ibid p18). However, Polanyi believed the long-term effect need not be negative, destructive analysis of such knowledge followed by re-interiorisation could result in a more secure and accurate basis for practice (ibid p19).

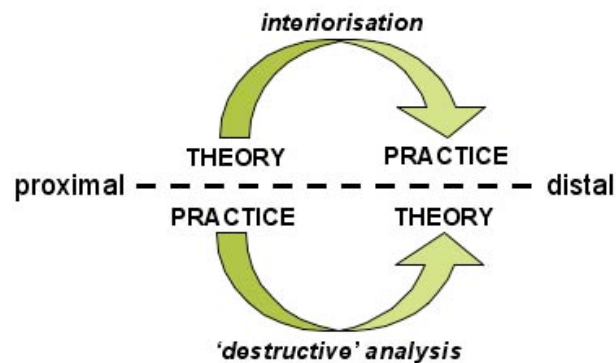


Figure 69: My interpretation of Polanyi’s theory<sup>30</sup>.

This was described prosaically by John Ruskin:

*You can teach a man to draw a straight line ... and to copy and carve any number of given lines or forms, with admirable speed and perfect precision; and you find his work perfect of its kind: but if you ask him to think about any of those forms, to consider if he cannot find any better in his own head, he stops; his*

<sup>30</sup> This is purposefully represented as two separate processes above and below the dotted line as I do *not* wish this to be interpreted as a cyclical process.

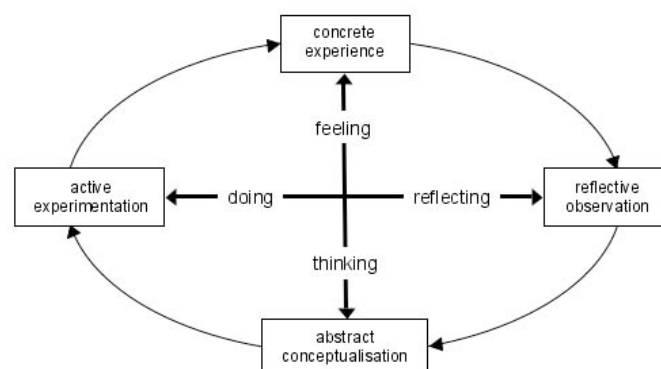
*execution becomes hesitating; he thinks, and ten to one he thinks wrong; ten to one he makes a mistake in the first touch he gives to his work as a thinking being. But you have made a man of him for all that. He was only a machine before, an animated tool."*

John Ruskin 1853 p84

### 5.3.4 Experiential learning and reflection

Whilst Polanyi and Ruskin suggested that attending from practice to theory could be destructive until turned back into action, there also exists a body of thought that in the right circumstances it could be entirely constructive.

A major strand of John Dewey's educational philosophy was that an experiential continuum was essential to a practitioner's performance, leading to a development of both emotional and intellectual attitudes to practice that influenced their further action (Dewey 1938 p250). From this, David Kolb developed a model of experiential learning consisting of two opposing modes of gaining experience of the world: concrete experience (feeling) and abstract conceptualisation (thinking); and two opposing modes of transforming that experience: reflective observation (reflecting) and active experimentation (doing). He suggested there was an idealised cycle whereby a learner would "touch all the bases": feeling, reflecting, thinking, doing and "knowledge ...[would be] created through the transformation of experience" (Kolb 1984 p41).



*Figure 70: Kolb's experiential learning model.*

The problem with this representation, as discussed with regard to action research, is that it appears to represent a sequential process and this is rarely borne out in practice (see Methodology p16). However, viewed in the light of Polanyi's concepts: to the left, practice

(concrete experience) is being attended to from theory (abstract conceptualisation) with the interiorisation taking place through a process of active experimentation. To the right is the converse with theory being attended to from practice through a process of reflective observation, however this is now viewed as a constructive process, rather than Polanyi's destructive analysis.

Donald Schön gave insight into the reflective process through studying the nature of professional practice with a view to understanding what made those at the top of their profession exceptional. He described a concept similar to Polanyi's 'personal knowledge' that he called 'knowing in action': "When we go about ... spontaneous, intuitive performance ... we show ourselves to be knowledgeable in a special way. Often we cannot say what it is we know. ... It seems right to say our knowing is in our action" (Schön 1983 p49). Prior to describing in detail his modes of reflection, I shall clarify my understanding of three of his key concepts:

- action-present: the period of time in which action could still make a difference to the situation, depending on the practice this could be anything from a matter of seconds to hours or even days (ibid p62).
- knowing in action: the knowledge that guides skilful performance but does not depend on the practitioner being able to describe what he is doing or even being consciously aware of the knowledge behind his actions (Schön 1987 p22)
- knowing in practice: a practitioner's professional knowledge, encompassing both the professional context of the practice and the activity involved in undertaking and developing the practice (Schön 1983 p60).

The first, and simplest, mode of reflection identified by Schön is reflection *on* action (1987 p26). In this situation an unexpected event caused the practitioner to stop and reflect upon the likely causes outside the action present. Having thus identified a likely solution the practitioner would undertake new action to test the explanation, revising their knowing in practice.

Whilst Schön was slightly dismissive of such reflection as it was not a

sign of a mature professional, from an educational perspective John Dewey sought to promote a similar course of action: "To be intelligent we must 'stop, look, listen' in making the plan of an activity" (Dewey 1916 p235), a three stage process of observing the current situation, considering alternative solutions then forming a plan for progressing. This clearly relates to Polanyi's 'destructive analysis' where actions are initially frozen but a clearer understanding is achieved through re-interiorisation of the theory through further action (Polanyi 1958 p50).

Dewey (1933 p5) considered the wider educational goal however to be a more fluid thought process. Key to this was a successive chain of thoughts building upon each other and moving towards some sort of a solution, although that solution may not be a final conclusion, merely a stepping-stone on the way. Schön echoes this in his description of reflection occurring entirely in the action present. In such an instance, rather than 'stop, look, listen', the practitioner remained absorbed in the task. The 'surprise' caused him to consider more closely and critically his current understanding of the procedure he had tacitly been carrying out, use his understanding of the 'surprise' to construct a new understanding, then test this with an on-the-spot experiment, thus revising his knowing-in-action (Schön 1983 p62).

Schön also described a more advanced stage of reflection in action where primary consideration of the 'surprise' did not lead the practitioner to a new understanding, so instead he found a new way of framing the problem, to see if this would bring about an alternative understanding of the situation (Schön 1983 p62). This required the skilled practitioner to assume one set of values to be constant to enable a test to be carried out on others and a conclusion reached before considering a further re-framing and re-testing of the question. "Constancy of appreciative system is an essential condition for reflection-in-action. It is what makes possible the initial framing of the problematic situation, and it is also what permits the inquirer to reappreciate the situation in the light of its back-talk" (ibid p272).

This concept was advanced by Chris Argyris who worked extensively with Schön studying the behaviour of individuals within business organisations and observed that individuals had two distinct theories of action: espoused theories and theories in use. Their espoused theories

consisted of the beliefs, values and attitudes which they advocated employing. Their theories in use were those they actually employed, of which they were not always aware and these were not always consistent with their espoused theories. When an individual discovered a gap between their espoused theory and their theory-in-use their natural tendency was to preserve their espoused theory, or at least minimise damage to it, by seeking an easy explanation for the difference: this was what he referred to as 'single-loop' learning (Argyris 1995).

More unusual, but from his observations by far a better strategy, was for the individual to use the perceived difference between the theory in use and the espoused theory as a means of re-assessing the governing values behind the espoused theories: what he called 'double-loop' learning. The key issue was that double-loop learning was far more than just reflecting on the actions taken in single-loop learning. It required the individual to undertake actions to challenge their established view of their whole practice (Argyris 2003).

This took professional development away from the narrow, problem-solving perspective, towards a more holistic concept of the practitioner being able to re-assess and move forward knowledge within their craft practice generally. Polanyi (1958 p196) referred to "the essential restlessness of the human mind", where practitioners exhibited a natural desire to make discoveries by setting themselves new problems. In the process they established new theoretical frameworks, tested them, potentially destroyed all or part of them, but in the process established some form of new knowledge. He suggested that it was only through complete immersion in the field of study, a state he refers to as indwelling, that the existing limits to knowledge be broken down:

*Scientific discovery ... bursts the bounds of disciplined thought in an intense if transient moment of heuristic vision. And while it is thus breaking out, the mind is for the moment directly experiencing its content rather than controlling it by the use of any pre-established modes of interpretation: it is overwhelmed by its own passionate activity.*

Polanyi 1958 p196

The next consideration is what makes a practitioner behave reflectively? John Dewey highlighted the importance of the attitude of

the practitioner towards their practice, particularly their response to an unexpected event: something that interrupted usual routine or the discovery that the usual solution to a problem was not working, and this needed to generate doubt to stir the practitioner into seeking a solution (Dewey 1933 p14). Polanyi referred to it as "a first stage of perplexity" (1958 p120) and Donald Schön described the practitioner being "stuck in a problematic situation which he cannot readily convert to a manageable problem" (1983 p63). The practitioner must move from a state of certainty, where actions are instinctive and even mechanical, to a state of uncertainty where an indeterminate action is needed to restore the situation.

However, the practitioner might look for an easy solution, jumping at the first answer that occurred to him out of laziness or impatience (Dewey 1933 p16), or they might side step the problem in an effort to preserve their current knowing-in-action (Schön 1987 p26). This is the process referred to as "single loop" learning by Argyris (2005) where action was taken to preserve rather than question the theory in use. Alternatively, Dewey suggested the practitioner may be prepared to prolong the state of doubt and embrace the problem as something of interest in its own right, using it as a "stimulus to thorough enquiry" (1933 p16), providing they were prepared to be:

- open-minded: open to alternatives in an active, positive way
- whole-hearted: taking absorbed interest in the subject at hand
- intellectually responsible: ensure the train of thought is consistent and followed through to the end (1933 pp30-32)

### 5.3.5 Received wisdom

So far the consideration of developing craft skills has been focussed on self-development by the practitioner, but I feel it is important not to neglect the importance of the accumulated knowledge of previous generations of practitioners. Given that much of this knowledge is tacit, Polanyi observed that it could be "assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another. A society which wants to preserve a fund of personal

knowledge must submit to tradition.” (1958 p53)

In her study of the great Japanese ceramicist Shoji Hamada, Peterson (1974) described the relationship between deshi (apprentice) and master: “To learn as a deshi means to submit one’s self to the master, to leave one’s own self, to become ‘in’ the master. This ‘surrender’ to the master does not mean just blind imitation, but gives a spiritual discipline and the opportunity to absorb a skill into one’s bones.”

However, in current English language usage ‘received wisdom’ has strikingly negative connotations: whilst the dictionary definition is “widely accepted as authoritative or true”<sup>31</sup>, in common usage this is understood as “knowledge that people generally believe is true, although in fact it is often false”<sup>32</sup>. This fits with Schön’s comment that our current culture espouses independence of thought and action and this generates negativity towards *any* sort of imitation (1987 p120), which would explain the negativity towards the traditional apprenticeship situation where the novice must initially imitate without understanding.

According to Polanyi, the difference between the skill of the novice and that of the expert is “a gap to be bridged by an intelligent effort”. He unfortunately only views this from the perspective of the expert, explaining “Our message had left something behind that we could not tell, and its reception must rely on it that the person addressed will discover that which we have not been able to communicate” (1966 p6). The onus in his terms is on the novice to understand through intelligent effort. As discussed in the Methodology chapter (p16), Polanyi viewed this as a kind of indwelling that I refer to as empathic indwelling, where the novice attempts to interiorise the master’s skill. To use Polanyi’s example (1966 p30) a chess player might re-enact a master’s game to gain a feeling for his skill.

Schön similarly referred to “an apparently unbridgeable communication gap” (1987 p101) between novice and expert however he suggested the solution was in “reciprocal reflection-in-action” implying that the

<sup>31</sup> definition from Concise Oxford English Dictionary (2002)

<sup>32</sup> meaning from The Free Dictionary, [<http://idioms.thefreedictionary.com/conventional%2Freceived+wisdom>] accessed 11/06

expert needed to make as much effort as the novice in the process of bridging it. Whilst retaining the necessity for the novice to initially suspend any disbelief, put their trust in the expert and imitate the expert's practice, Schön softened the process by calling it reflective imitation, where the novice copied the expert but also reflected on what they were doing (1987 p120).

Schön also described the difficulty that could arise when the expert did not respond reflectively, simply seeking to correct 'mistakes' at face value rather than trying to understand the reasoning behind them, creating a defensive attitude in the learner (1987 p136). Instead, the expert needed to view the novice's actions in response to instruction as revealing the meaning they had constructed for that instruction. They needed to observe the novice's actions reflectively and respond back until they felt there was a convergence in meaning (1987 p104).

Nonaka & Takeuchi (1995) did much to popularise the work of Polanyi and the concept of tacit knowledge within the field of knowledge management. Their description of how individuals share tacit knowledge within large organisations led to a widespread belief that tacit knowledge could be transmitted from one person to the next by making it explicit which I feel to be in need of closer examination.

Their description of knowledge creation within an organisation involves a spiral with a tacit to explicit process, 'externalization', then an explicit to explicit process, 'combination', an explicit to tacit process, 'internalisation' and a tacit to tacit process, 'socialization', and so on as shown by the illustration below:

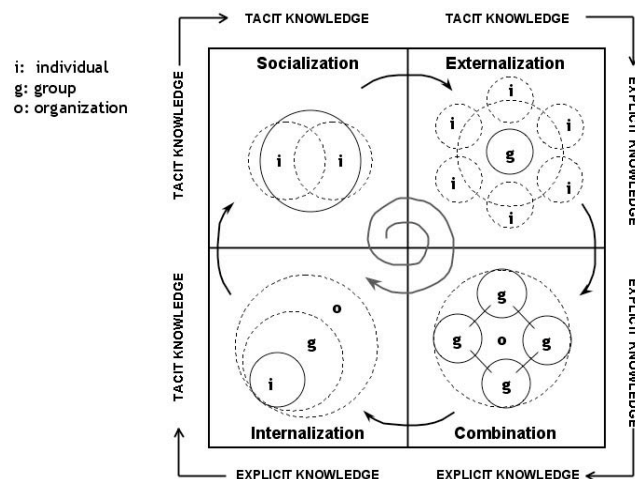


Figure 71: 'Knowledge Creation Spiral' (from Nonaka & Konno 1998)

Firstly, to look more closely at their explanation of tacit to explicit knowledge, they say, "externalisation is a process of articulating tacit knowledge into explicit concepts. It is a quintessential knowledge-creation process in that tacit knowledge becomes explicit, taking the shapes of metaphors, analogies, concepts, hypothesis or models" (1995 p64). This may be the origination of the concept that "tacit knowledge becomes explicit", having lifted the phrase from the context in which it was written, although the broader concept is that explicit knowledge is used to articulate the tacit. As Rust (2004) says "the idea that people's tacit knowledge can be somehow extracted and made explicit in the form of rules for all to employ ... is fundamentally misguided". The implication is that tacit knowledge could be articulated verbally through metaphors, analogies etc. or, as frequently observed in the craft context, visually through demonstration, sketching or modelling. Gamble (2002) gives a vivid description of such an interaction from her observation of cabinet-making apprentices at a trade school in South Africa: "When asked in an interview about the propensity to draw everything, an apprentice called drawing his 'third language' (in addition to two spoken languages)."

Nonaka and Takeuchi illustrated their understanding of the tacit to tacit process by describing a manufacturer who was developing a bread-making machine and struggling to replicate the kneading process. Although the dough made by the machine looked the same as that made by a master baker, when baked it tasted nowhere near as good. The problem was solved by one of the manufacturer's employees who 'apprenticed' herself to a master baker (p64): "One day ... she noticed that the baker was not only stretching but also 'twisting' the dough, which turned out to be the secret for making tasty bread".

At face value this again implies that a simple piece of explicit knowledge could be used to explain the baker's tacit knowledge, reinforcing the "making tacit explicit" concept. On closer examination it could be argued that, whilst the master baker was an expert in manual bread making, he probably had little knowledge of bread making machines, and for the researcher it was probably the opposite. It was only through the researcher gaining personal experience of manual bread making to build her personal knowledge of the subject that she

was able to interpret the actions of the master baker in comparison to that of the bread-making machine. By dwelling in the craft she was able to combine her personal knowledge of manual bread making with her personal knowledge of how the bread-making machine worked and produce the explicit concept of the machine twisting the dough to more closely replicate the action of the master baker. This could be seen as finding an explicit concept to articulate tacit knowledge rather than a process of making tacit knowledge explicit.

Further to this it could be proposed that in a craft context what Nonaka & Takeuchi called "socialisation", the pure tacit to tacit process, occurred only between people with skills or experiences in common, who were able to dwell in the other's thoughts or actions without needing explicit interpretation. This ability would be more likely to manifest itself in a more advanced learner who had shared experience and developed a shared language with other practitioners. "By such exploratory indwelling the pupil gets the feel of a master's skill and may learn to rival him" (Polanyi 1966 p30).

Lev Vygotsky (1934) in his classic study of how language is learned discussed the use of abbreviated language between people with a close familiarity. "If the thoughts of two people coincide, perfect understanding can be achieved through the use of mere predicates, but if they are thinking about different things they are bound to misunderstand each other" (p236). He illustrated this with a passage from *The Diary of a Writer* (1873) where Dostoevsky described walking home behind a group of drunken workmen and overhearing a conversation between them that entirely consisted of one (unprintable) word. He concludes, "So, without uttering a single other word, they repeated that one beloved word six times in a row, one after another, and understood one another completely."

### 5.3.6 Conclusion

The literature considered in relation to craft knowledge shows that such knowledge is considered to be highly personalised, context-specific and tacit. Craft skills are learned through experience and various forms of reflection can be of positive influence to this learning.

Received wisdom from experts can also be influential to the learning process, but initially this will require the learner to demonstrate trust and belief in the expert. The expert may use explicit concepts to articulate their personal knowledge and must reflect on the response of the novice to ensure a convergence of meaning.

In the next section the practical work previously undertaken, particularly that of the bowl turning novices, is reviewed in the light of this theory and used to form the speculative framework for understanding craft learning proposed in section 5.5.

## 5.4 Practical Work

### 5.4.1 Introduction

In this section I review the practical work undertaken with experienced and novice craft practitioners described in chapters 3 and 4 in the light of the above theory<sup>33</sup>. This provides greater insight into the nature of craft knowledge and learning from both the novices' and the experts' perspective and provides a basis for the framework described in the following section.

### 5.4.2 Tacit craft knowledge



*Figure 72: Espoused theory for holding tool.*



*Figure 73: Theory in use for holding tool.*

The tacit nature of craft knowledge was revealed during the initial work with Robin Wood when exploring the issue of the way the turning tool should be held (see p40). The interview in which this knowledge was initially elicited was conducted away from the workshop and he advocated his espoused theory: that the hand should clamp the tool to the rest. This differed from the observed theory in use: that the hand frequently gripped the tool in a fist behind the rest.

On observing a novice using the latter technique [GB1 t45.25], the tacit nature of this knowledge was evident in the inability of Robin to explain his theory without demonstrating with a tool in his hand. This explanation was again his espoused theory and, when shown the video footage of his practice revealing the difference to his theory in use, his instinct was to find reasons to preserve his espoused theory by attempting to construct alternative reasons for the different handhold.

Upon returning to the lathe and offering the tool up to the learner's bowl, Robin reluctantly accepted the observed hand grip might be valid, but at this point still declared his espoused theory was equally applicable. It was only later when turning a bowl himself that Robin was able to truly acknowledge his theory in use: "I do hold the tool like

<sup>33</sup> references in the text to specific instances in event logs take the form [HS2.3 t0.32]: HS = participant's initials; 2.3 = session 2, tape 3; t0.32 = time code 32 minutes

that, don't I!" [GB1 t1.09].

Considering this in the light of Polanyi's theory, Robin could be seen to only know the theory of how to hold the tool through his practice, when theory was the proximal term and practice the distal. When trying to access this theory during elicitation he came up with a plausible explanation, which was how he often held the tool when hollowing inside the bowl, but not one that worked universally or in the circumstance under discussion. Even having observed himself on video, he was only able to really acknowledge his theory in use through re-interiorisation, returning to his normal practice, then shifting the focus of his attention from the practice to the theory and seeing how he was holding the tool.

Experienced clog maker Jeremy Atkinson highlighted the value to the craft practitioner of tacit knowledge during an interview. He observed that Parfitt, a relative novice, had a tendency to concentrate so hard on each individual part of the process that he lost sight of his overall aim.

*"Geraint's got to the point where he can manage everything but he's concentrating so much on each individual task he doesn't look at the whole. Which is easy to do. It's just a sort of transitional thing. He can do all the individual things but because he's concentrating so hard on it he's not always stepping back."*

Interview Jeremy Atkinson 17.8.05 [event log JA5.1 t0.45]

It could be argued that at Parfitt's early stage of learning his focal awareness was on the cutting edge of the tool and not on the form he was producing. In contrast, Atkinson's use of tools was tacit and hence of subsidiary awareness, so his focal awareness was on the form of the sole he was carving.

### 5.4.3 Experiential learning

There were three sessions with wood turning learners where the focus was on the novices working experimentally, relying largely on reflecting on their own experience rather than any given interpretation. The first was the initial session [GB1] where the learner and I were establishing what interpretation was required, the second was the next session with this learner [GB2] where interpretation was supplied but

he proved reluctant to use it, and the third was the session with a new learner [MK1] who also declined help from any interpretive materials.



Figure 74: Preliminary tool angle interpretation.



Figure 75: Giles experimenting with tool angles

On his first visit, the only assistance Giles had was some video clips of the expert and the theory I had constructed through interviewing and observing him, which was very limited. I was aware that I had failed to understand the theory behind the angle at which the tool should meet the wood, but was uncertain of its relative importance and interested to see if the novice could work it out for himself. Giles was keen to experiment with different tool angles, but struggled to find a workable solution [GB1 t0.14, 0.18, 0.20]. When he finally did find an angle that worked [GB1 t0.25] it only worked for part of the side of the bowl because he did not have enough understanding to move the tool to follow the contours of the bowl.

By his second visit I had produced some drawings as explicit interpretation of the tool angles but, after an initial look, Giles was very reluctant to use them and instead was highly experimental, performing some extraordinary manoeuvres in an attempt to overcome problems. He showed signs of having remembered the 'twist' angle which he had gained an understanding of on the previous session, but still could not adapt it to follow the contours of the bowl so he became exhausted and demoralised [GB2 t0.17-0.54].

Mick already had a little experience of turning and was adamant he did not want any help or to view any interpretation. Turning the outside of the bowl unaided he consistently used an incorrect angle but, being tall and strong, was able to hold the tool steadily when it was not cutting correctly so appeared more successful. Upon viewing video of the expert he was able to identify that the hook tools he was now using worked differently to the gouges he was used to<sup>34</sup>, but after further experimentation he admitted he had no idea at which angle the tool should be held [MK1 t1.17].

I would speculate that the novices' lack of personal knowledge of the skills meant they had difficulty interpreting their own experiences and were unable to act reflectively. This is possibly because they were

<sup>34</sup> An explanation of the difference between gouges and hook tools is provided on p71.

trying at a too early stage to work with practice as the proximal term and theory as the distal term. There was also little evidence of reflection *on* action, possibly because at this early stage they only knew their theory through their actions.

In nearly all the sessions, the learners used some explicit interpretation in the form of drawings as a learning aid that appeared to produce more sign of reflective thought. In the first session [GB1], the only explicit interpretation available was the drawings of the handgrip on the tool. Giles twice showed signs of reflection, firstly saying that he had found altering his grip helped him control the tool and he would not have thought to do that without having seen the drawings [GB1 t0.33]. He also commented that taking a break had proved beneficial in giving him time to think about the material he had seen and now he could think much more as he was working [GB1 t0.34].

Helen was keen to ask for help and engage with the explicit interpretation available to her during her first session [HS1]. She rapidly showed signs of experimenting with two of the three tool movements from the interpretation, but when I mentioned the third she admitted to having forgotten about it [HS1 t0.25]. However, upon reminding she was able to make the correction, although for the first few times she asked me what was wrong and I turned the question back on her, before she was able to spot the problem and correct it herself [HS1, t0.31, 0.33, 0.37].

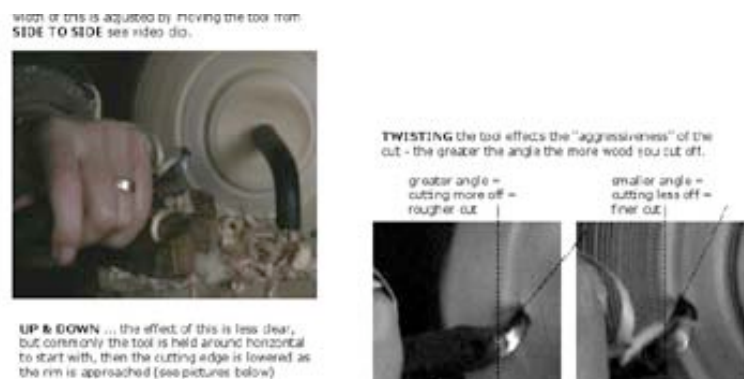
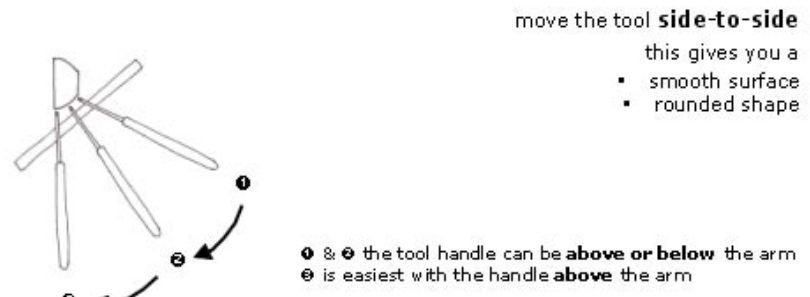


Figure 76: Tool angles from Resource II / HS1.

On her return visit, Helen showed signs of remembering about the tool angles she had used previously [HS2.1 t0.00] but when she actually started turning she struggled to achieve a good cutting angle. Instead she started to drag the tool across the surface of the wood as she was cutting, creating a very irregular surface that became increasingly

difficult to manage. Subsequent discussion revealed she was acting in response to her understanding of the interpretive sheets [HS2.1 t1.35] that were subsequently revised to avoid this confusion.

*Figure 77: Tool angles from Resource III / HS2*



Andy was also familiar with turning using gouges rather than hook tools, but studied the explicit interpretation closely and was able to immediately adapt his technique and gain a correct cutting angle on the outside of the bowl [AB1.1 t0.00, 0.11] and later returned to look at the diagrams again to refine the technique [AB1.1 t0.13].

It appears that given a 'bridge' in the form of some explicit interpretation, these learners showed signs of being able to interpret their own experiences. They could attend from this given theory to their practice and thus appeared to be able to reflect on the theory. In GB1 and initially in HS1 reflection on action can be seen: they both have a tendency to stop, go and look at something, come back and experiment with their interpretation of what they have seen. In HS1 this can be seen to develop into reflection in action as the tool snags and Helen corrects it, commenting "the same" without breaking her stride [HS1 t1.06].

However, Andy was unable to transfer his understanding of tool angles to hollowing inside the bowl where only video was available with no explicit interpretation. He repeatedly experimented then returned to watch the video but could not achieve a good cutting angle and eventually I called Robin, the expert, in to provide assistance. When first asked, Andy seemed uncertain whether the explanation from Robin had helped, but subsequently he was able to get the tool cutting well [AB1 t0.46, 0.48]. I would interpret this as the novice being unable to construct a bridge to the video on his own, but once the expert provided the start of one, the novice was able to grasp and apply it, a demonstration of effective reciprocal reflection.

Robin also attempted an explanation of hollowing inside the bowl to Helen when she was in difficulties, but she continued to struggle to achieve the correct cut and Robin had to physically correct the tool angle to help her [HS2.2 t1.26, 1.30, 1.32, 1.33]. This could be seen as a failed attempt at reciprocal reflection where the gap was not bridged, although a major influencing factor was undoubtedly the tiredness of the novice.

#### 5.4.4 Received knowledge

As previously discussed, the wood turning learners were keen to watch video of the expert turning but they frequently struggled to relate what they had seen to their own work [GB1 t0.15-20; GB2 t0.01-0.04, 0.05-0.06, 1.06-1.10; HS2.1 t1.47, HS2.2 t0.23-0.28, 0.30-0.35, MK1 t1.07-1.17, AB1 t0.21, 0.28, 0.33, 0.35, 0.37]. Similarly, after watching the expert demonstrating, they tended to have difficulty replicating the action they had seen when they returned to the lathe themselves [GB1 t1.27-1.33; HS2.2 t1.30]. It was only Helen who had a few successes at following the video on its own, the first was a video clip that actually had a little commentary from the expert [HS1 t1.01] and the other three without [HS1 t1.29-1.32; HS2.2 t0.02-0.04, 0.44].

I would interpret this as the learners not having sufficient knowledge of what they were observing to be able to interpret it themselves: there was too large a gap between their knowledge and that of the expert for them to be able to construct their own bridges across this gap unaided.

The expert's first attempts at teaching directly were also largely unsuccessful. When first attempting an explanation of the cutting angle on the outside of the bowl to Giles there were clear communication difficulties with misunderstandings about the meaning of such words as twisting and pivoting [GB1 t0.43, 0.44, 1.01, 1.02 1.05]. On each occasion Robin had to physically move the tool in Giles' hands to show him the correct angle. By the time Giles was turning inside the bowl, he could understand what Robin meant when told to twist the tool but could not identify the problem himself [GB1 t1.46, 1.49]. Finally Robin attempted a fuller explanation using angles, showing him where 90°

and 0° were then telling him to aim for 10° which proved more successful at that time [GB1 t1.53] although on his subsequent visit he did not appear to have retained this knowledge.

This could be seen as the start of reciprocal reflection; the experienced practitioner was also starting to reflect in an attempt to bridge the gap between his knowledge and that of the learner. It was following this that Robin thought out the alternative explanation which he performed direct to camera and formed the explicit interpretation provided for turning the outside of the bowl which was successfully used by the learners.

The final point of interest arising from this interaction between Robin and Giles in the first session, showed Giles having tested and found wanting received knowledge, so developed his own theory:

*GB: One thing that's quite difficult. You're saying that I'm to put it in at this angle, at times anyway, but you're also saying to turn it this way, whereas if it's flat onto that and I turn it this way then obviously it comes out. So I've just been inching my hand along.*

*RW: So you've been listening to what I say then working out the actual way to do it, obviously!*

event log GB1 t1.03

Whilst Giles' meaning is not exactly clear, Robin seems quite happy to accept Giles' interpretation without needing to defend his own. Possibly this was as a result of finding his explanation of how the tool should be held was incorrect, or possibly because it did not seem an important-enough issue to debate and it was more important for Giles to build his confidence in his own abilities.

Whilst I did not have the chance to observe any wood turning learners at a more advanced stage, the clog makers did offer this opportunity. I noticed that during the two months I followed the progress of novice clog maker Parfitt, although I became increasingly familiar with the craft, I found it progressively more difficult to follow exchanges between him and expert clog maker Atkinson. It appeared that, through shared experiences, Parfitt and Atkinson were developing a communication that was increasingly tacit and inaccessible to myself.

Robin Wood described a pure tacit to tacit transmission when watching another turner, André Martel, who uses the same sort of hook tools

but on an electric lathe, making a bowl on Wood's foot-powered lathe:

*"He just naturally turned the tool over and cut back at it from that side, which I'd never done before and I said, "oh no, you don't use it that way" and then I stopped and thought, "ah, that's actually quite helpful" and so I do that quite often myself if I've not got a flat rim. So I'd been a full time professional turner for 5 years before I started doing that."*

Robin Wood interview 7.1.04 [event log RW1 clip2 t29.50]

As one of few experts in his field, Wood was used to being the authority on the subject, so his instinct was to correct the other turner and preserve his espoused theory. His rapid re-assessment of the situation might have been influenced by knowing Martel was also highly experienced in making and using the tools they have in common, although they use radically different lathes. Once he had acknowledged the authority with which Martel was speaking, he was able to reflect and see the value in what was being done. As an experienced practitioner he was able to make sense of what he was observing without the need of interpretation or action.

#### 5.4.5 Conclusion

Consideration of the wood turning novices leads me to conclude that as a main starting point both Helen and Andy could be seen attending from the received theory in the interpretation to their practice. They both initially used reflection on action, frequently stopping, looking for help then returning to their practice, and then showed signs of progressing to reflection in action, being able to problem solve as they worked.

Whilst Helen on the face of it struggled, this could be seen as being largely due to the experimental nature of the process: not having the lathe set up for her diminutive size, having some experimental resources for her received knowledge which were not always helpful or open to misinterpretation, and having to work right-handed when she was left-handed. However, when considering her actions, it could be seen that she was responding reflectively, both taking received theory then attempting to test it and trying to develop her own theory.

Andy had the added advantages of being more physically adept and having some much more resolved interpretation to work with. His

reflection on action was easily observable, frequently swapping between the computer and the lathe. As he verbalised less than Helen, it was not possible to definitely identify any deeper reflection, but the experimentation he undertook and the steady improvement that could be seen to his technique as he turned his second bowl implied that he was successfully reflecting in action.

Giles and Mick were both disinclined to use any interpretation and, when they did look for help, turned to watching video and attempting to interpret it themselves. As neither was naturally communicative, the degree of reflection they achieved could only be assumed from their actions. As their experimentation often did not follow any perceptible pattern and there was little sign of consistent improvement, this implied frequent rather random experimentation without much consistent reflection. Both appeared to have practice as the proximal term of their tacit knowledge and theory as the distal for their main starting point: they were trying to construct theory from interpreting their own actions and finding it a complex process. Not that it is unachievable, it is the way Robin learned because at that stage there was nobody else practising the craft, but there must be a greater chance of becoming exhausted and demoralised in the process as Giles found on his second attempt.

More recently and outside the scope of this research project, Mick arranged with Robin to come back to turn another bowl. On arrival he expressed disappointment that the interpretive sheets he had seen previously that had been left in the workshop by Helen were no longer there. Instead Robin gave a short demonstration, then stood with him for a little to help him understand the tool angles before leaving him to experiment. Robin was of the opinion he made better progress on this attempt, achieving a better cutting angle with the tool.

These differences of approach by the learners could be seen as a demonstration of what Kolb (1984 p61) identified as learning styles. I could have tested them to prove it, but with only four learners I did not feel this would prove anything or help progress this study. What can be deduced is that self-directed learners are likely to approach their learning in different ways and find some parts of the process

easier than others.

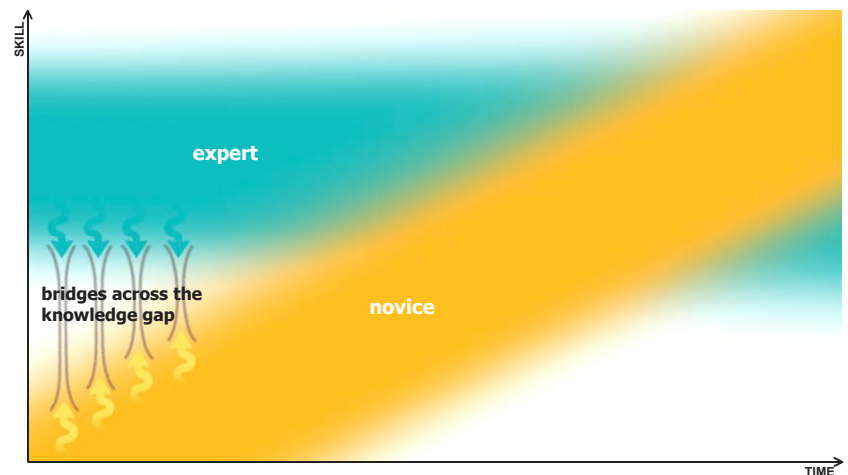
This is considered in the next section where I discuss the probable outcome of different forms of reflection and speculate on the potential learning paths different novices might take.

## 5.5 Discussion

### 5.5.1 Introduction

In this section I draw some speculative conclusions about the observations of wood turning novices described above and the different skill levels emerging from the study of the clog makers described in section 5.2. I illustrate this with a series of drawings that I have developed to assist my thought process however, whilst they may look like graphs, they need to be viewed as maps of concepts rather than mathematical representations.

My hypothesis is that there are two people, a novice who wishes to learn a craft skill and an expert, a master craft practitioner. The novice's aim is to bring his practical craft skill at least up to the level of the expert and potentially above it. Assuming she wishes to benefit from the accumulated experience of previous practitioners, she will need to make use of received knowledge from the expert, but there is a 'knowledge gap' between the two which needs bridging:



*Figure 78: The knowledge gap between craft novice and expert.*

The expert might start by demonstrating but, rather than leaving the novice to try and interpret what they see, the expert might provide a commentary, thus attending from his practice to his theory. The expert's commentary will use explicit concepts in an attempt to bridge the gap, and the novice will need to undertake some form of action in response to this received knowledge, primarily imitating the expert, but in a reflective manner. The expert in turn should observe and reflect on the novice's response, considering revising his interpretation until a

consensus of understanding is reached and the gap is bridged.

As the skill of the novice progresses, they will need less help directly from the expert, instead being able to observe, form their own interpretation and take action to test it. The novice will also increasingly rely on their own experience to develop their skill, constructing their own theory and performing experiments to test it. Finally the novice may be able to learn from the expert through observation alone: tacit to tacit communication will be more likely to occur when the novice is able to understand simply through observation without need for action, just through indwelling.

The novice is also increasingly likely to be influenced by other practitioners, both within their own craft and potentially other related crafts. This was traditionally called the journeyman phase where, upon completing their apprenticeship, they travelled to work away from the area where they had learned their skill, both gaining the benefit of other craftsmen's skills and spreading their own knowledge (Epstein 2004). Here too they might experience a knowledge gap that might need bridging as they develop ways of communicating outside their direct sphere of experience:

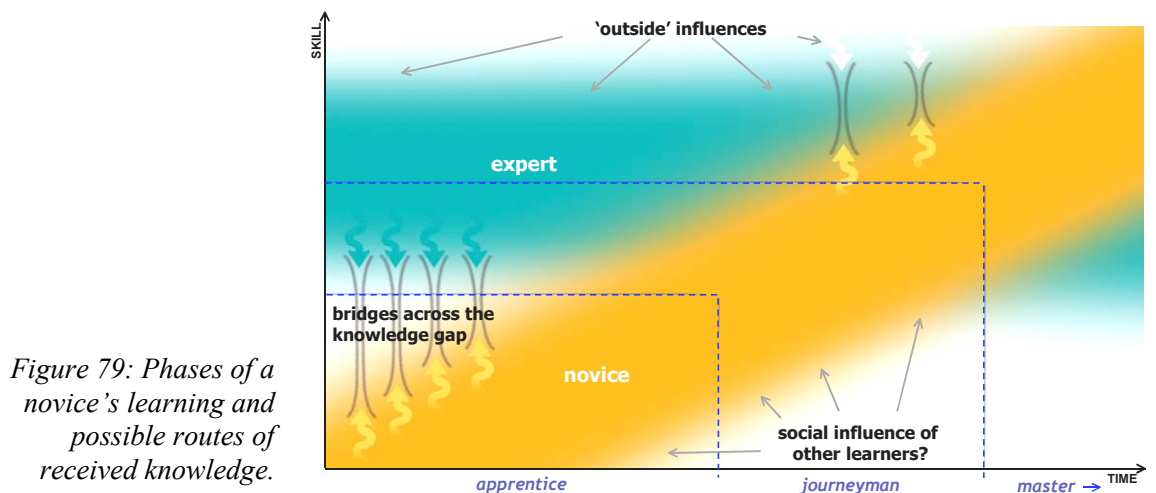


Figure 79: Phases of a novice's learning and possible routes of received knowledge.

The final element that is included on the above diagram, but not discussed is the social element, the influence of other learners. There was not the time to explore this aspect of learning during the current research, but I plan to do so in my post-doctoral research.

In the above diagrams the 'knowledge paths' have been drawn straight and parallel sided and the novice's rises steadily to meet the expert's.

The wood turning learners described above appeared to make different starts to their learning and the biographies of the clog makers concluded with an implication that the different practitioners peaked at different levels. To speculate on how these different paths might be formed, I shall consider in detail the different forms of reflection described in section 5.3.4.

### 5.5.2 Modes of reflection

In reviewing the literature relevant to learning craft knowledge<sup>35</sup>, I identified reflection as an important element that enabled a craft practitioner's thought to be turned back on action in a constructive manner. In this section I aim to consider the possible effects on the practitioner of different modes of reflection, developing further the illustrations used above as a representation of my understanding.

Schön defines the action present, the period of time in which the actions of the practitioner could make a difference to the situation, as forming the boundaries of the practitioner's knowing in action. If the figure on the right is thought of as being three-dimensional, the figure on the left can be seen as a slice through it at the point of the action present (A-A):

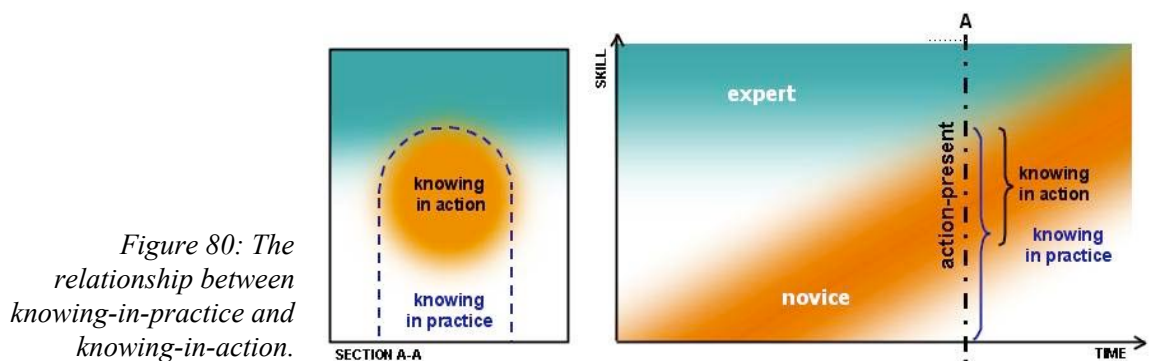


Figure 80: The relationship between knowing-in-practice and knowing-in-action.

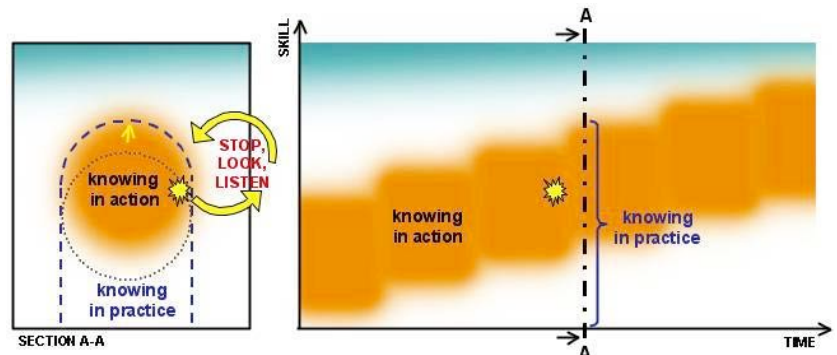
The first mode of reflection I identify was described by Schön as reflection *on* action (1987 p26) and this closely relates to the approach described by Dewey as 'stop, look, listen' (1916 p235) and Polanyi as 'destructive analysis' (1958, p50).

Reflection on action occurs when an unexpected event causes the

<sup>35</sup> see section 5.3.4, p111.

practitioner to stop, look at what they are doing and think about what has happened and how to proceed. During this process the practitioner reconsiders their knowing in action, identifies a possible solution and returns to the action-present to test the solution. The result of this will be an overall increase in the practitioner's knowing in practice although, with the thought process occurring outside the action present, the portion of this which is knowing in action will tend to remain the same:

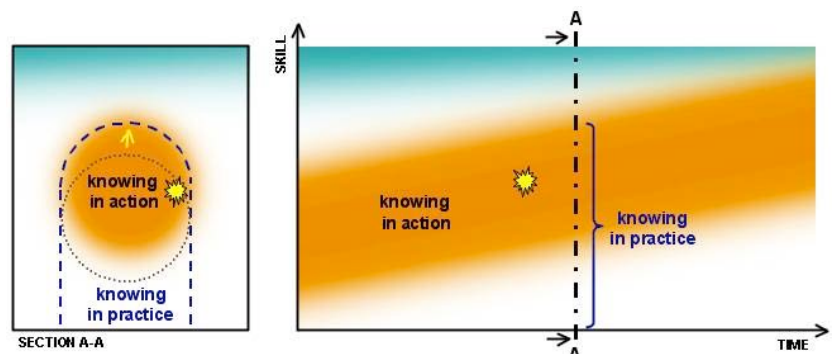
Figure 81: Mode I: reflection on action.



The second mode of reflection I identify is an element of what Schön (1983, p62) referred to as reflection *in* action and is entirely contained in the action present: rather than 'stop, look and listen' the practitioner remains absorbed in his task.

Primary reflection in action is where the unexpected event causes the practitioner to become aware of the procedure he has tacitly been carrying out, use his understanding of the surprise to construct a new understanding, then test this with an on-the-spot experiment. This allows the practitioner to revise his knowing in action, but now with a smooth upward progression as the process is entirely carried out in the action present:

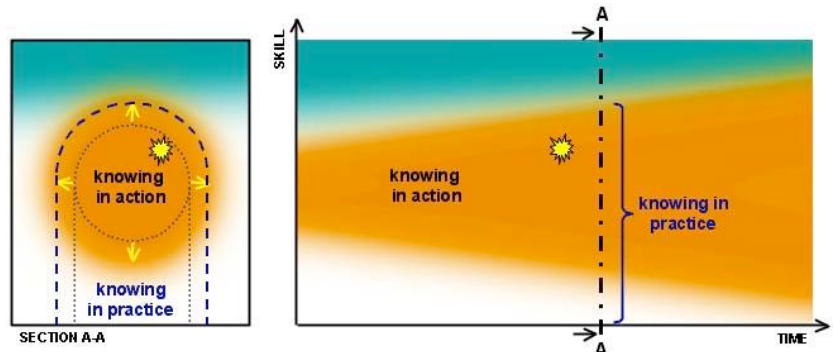
Figure 82: Mode II: primary reflection in action.



The third mode of reflection I identify is described by Schön as an advancement of the above process of reflection in action (Schön 1983

p63). The practitioner finds that primary consideration of the unexpected event does not lead to a new understanding, so instead finds a new way to frame the problem, to see if this will bring about an alternative understanding of the situation. If successful the result will now be an increase of knowing in action rather than just a shifting upwards:

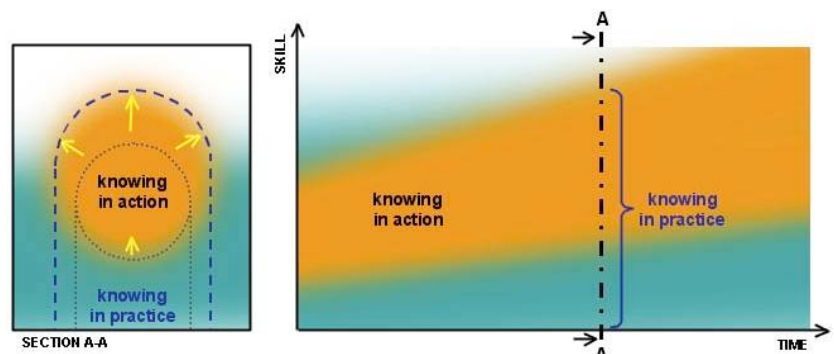
Figure 83: Mode III: secondary reflection in action.



The side-effect interestingly implied by this diagram is that knowing in action becomes a larger portion of knowing in practice, demonstrating the observed tendency of skilled practitioners to become increasingly absorbed and less able to articulate their practice over time.

The fourth mode of reflection I identify is derived from Argyris' concept of double-loop learning where, more than just reflecting on the actions being carried out, the practitioner undertakes action that challenges their established view of their whole practice (Argyris 2003). Through their action, the practitioner is reflecting on the whole of their knowing in practice, not just their knowing in action, leading to a simultaneous increase in both:

Figure 84: Mode IV: double-loop reflection.



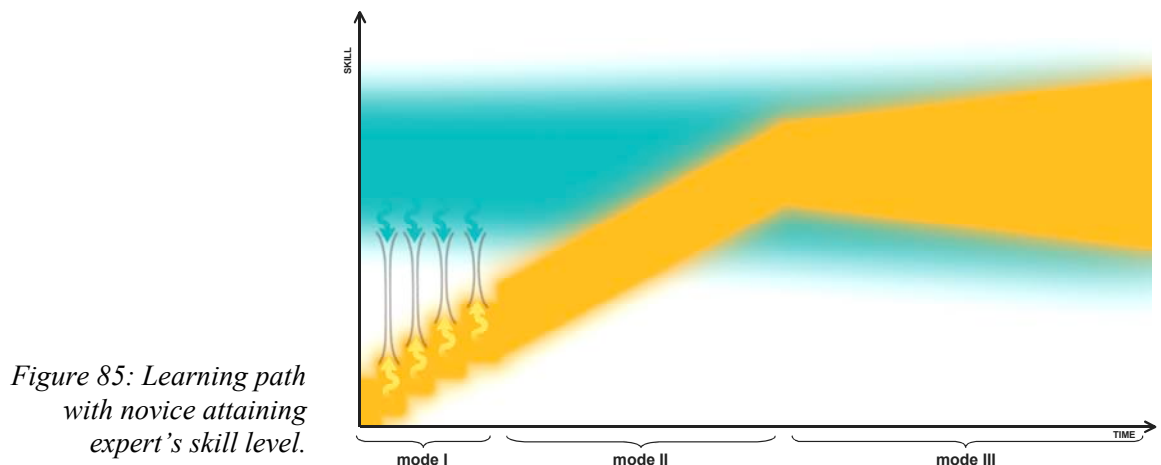
This takes skill development away from a narrow, problem-solving perspective, towards a more holistic concept of the practitioner being able to re-assess and move forward knowledge within their practice generally. I feel it is this mode of reflection that might enable a

practitioner to break the boundaries of the established knowledge of previous master craftsmen and establish new knowledge.

### 5.5.3 Learning paths

Observation of the different approaches to learning taken by the wood turning novices in section 5.4 leads me to propose that the path that each novice's learning takes will be influenced by changes in their predominate mode of reflection over time. I wish to stress the importance of the term 'predominate': the skill of the learners will operate at many different levels and at any one time they could be using more than one mode of reflection, but at any time one will be a dominant mode.

The traditional craft learner would have started as an apprentice with a master craftsman, then become a journeyman, travelling to broaden his knowledge by working with other craftsmen, and finally become a master in his own right (Epstein 1998). I would speculate the predominate mode of reflection for such a learner would initially be mode I, as they make use of received knowledge from the expert. Over time they would develop the ability to reflect in action, firstly with mode II and then mode III as they made use of their own experience to add to their theory:

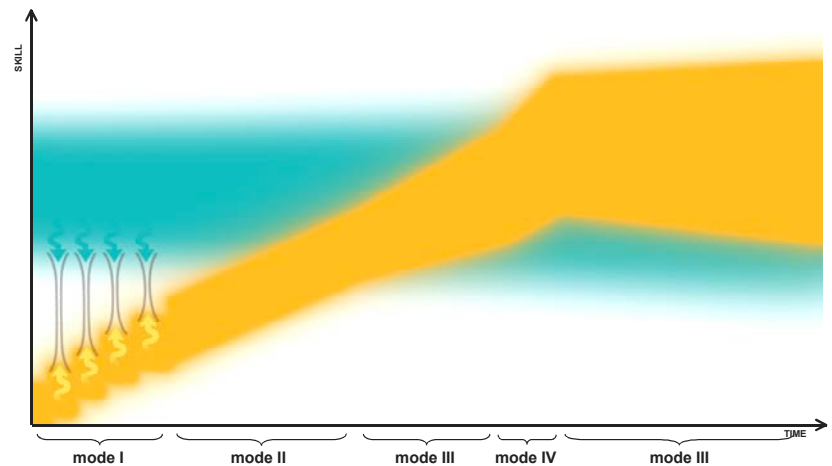


*Figure 85: Learning path with novice attaining expert's skill level.*

At the time when the traditional crafts were still thriving and there were many makers, 'breaking out' above the level of the master, characterised by mode IV (double loop) reflection, was likely to have been an infrequent occurrence or to achieve only minor increments in the level. As Christopher Alexander (1964 p34) commented about such

traditional craft practitioners: " ... actions are governed by habit ... there is little value attached to the individual's ideas as such. There is no special market for inventiveness. Ritual and taboo discourage innovation and self-criticism."

In the current climate, with craft knowledge in few hands and the loss of much of the basic knowledge base such leaps could be more likely to occur, as shown by Atkinson in the study of the clog makers described in section 5.2. Through a combination of research and practice, Atkinson 'broke out' above the skill level of the craft master who taught him:

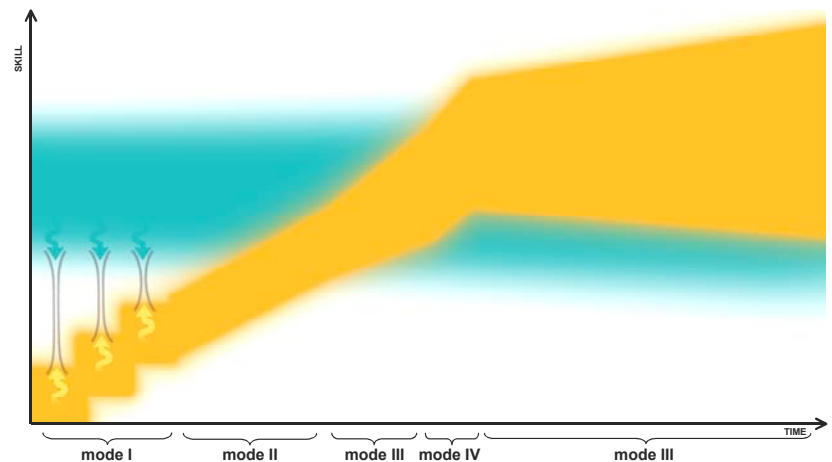


*Figure 86: Learning path with novice exceeding expert's skill level.*

However, such double-loop reflection appears to be an occasional and transitory phase. Having taught himself to make clogs from green sycamore, Atkinson created theory to explain his failure with alder rather than re-examining the failure. It appears that in regular practice reflection in action seems to predominate, leading to skills becoming increasingly internalised and tacit as the underlying theory remains the proximal term and practice the distal. However, observation of both Wood and Atkinson working with novices leads me to believe attempting to communicate their craft skills could help refocus the experienced practitioner's attention again on their theory, particularly if they are prepared to engage in reciprocal reflection. This is the area I wish to exploit by working with an experienced learner to assist with elicitation and representation in my post-doctoral research.

Observations of the wood turning learners showed that some could be resistant to received knowledge, their determination to work it out on their own could result in their 're-inventing the wheel' or that they

become dispirited and give up. However, Robin Wood learned in this manner through necessity because there were no existing craft practitioners. Potentially this determination could result in a greater ability to see through the difficulties and an early reliance on the feedback from their own experience may mean they can progress with less received knowledge and are more absorbed so could be more likely to dwell in their craft and break out from the established boundaries:



*Figure 87: Learning path of self-directed learner.*

This theory provides additional understanding of the learning resource structure described in section 3.3. The 'guidance' phase, which takes the learner step-by-step through the process, supports the learner's early learning when reflection on action predominates. The 'development' phase in which the learner develops their skills through repetition and self-evaluation, provides a rich variety of material for the more advanced learner to use once reflection in action predominates.

#### 5.5.4 Conclusion

In this section I have proposed a theory of transmission of tacit knowledge based on the use of bridges of explicit knowledge across the knowledge gap between the personal knowledge of novice and expert. Ideally these bridges are formed through reciprocal reflection where both novice and expert reflect on the response of the other and adapt to the feedback until accord is reached. Over time, the novice should increasingly develop the ability to understand the actions of the expert without need of explicit interpretation and to conduct their own experiments using their own experience to interpret the feedback and

construct their own theory.

This process could be hindered by failures from either side. The expert could be dogmatic in his interpretation, seeking to correct the learner rather than attempting to engage in reciprocal reflection and revise his proffered bridge. Equally, the novice could reject the offered bridge, seeking to construct his own knowledge and become exhausted and disillusioned in the process. Finally, the novice could become too accepting of the received knowledge and not seek to question it, constraining himself to a shallow imitation of the expert's skill.

The role of the designer-researcher in the bowl turning practical work could be seen as facilitating the process of reciprocal reflection. I produced experimental bridges across the gap between the expert's and the novices' craft knowledge and worked with both sides to modify and refine them.

## 5.6 Conclusion

In this section I have described the decline and revival of clog making skills and reviewed the literature relevant to the learning of craft skills generally. This theory was used to reassess the progress of bowl turning learners described in chapter 3 and develop a framework for understanding how craft skills are learnt.

The background to the current-day context of gaining craft knowledge was provided by consideration of the skills of the last few clog makers in Britain. This revealed that, when the knowledge lay in the hands of so few active practitioners, learning through apprenticeship was not sufficient and broader research and experimentation was also necessary to validate and revise what was being taught.

The writings of John Dewey, Michael Polanyi and Donald Schön were considered to provide a theoretical background to reconsider the learning of craft skills. Polanyi's concept of tacit knowledge is used to describe the way in which an experienced practitioner knows much of the theory behind his skill only through the actions undertaken in regular practice. Dewey's theory of experiential learning and Schön's of reflection are used to explain how a practitioner's attention can be turned back on theory to improve skill.

The learning I observed, which is described in Chapters 3 and 4, was reconsidered in the light of this theory and used to construct a framework for the understanding of craft skills learning. I proposed that the practical skill of a craft practitioner is personal, context-specific knowledge which had a significant tacit element. For a novice to learn such a skill direct from an experienced practitioner they must start by imitating what they are observing, but this process can be assisted by the expert offering 'bridges' across the gap between their own knowledge and that of the novice. These bridges, evaluated in the design and testing of the bowl learning resource<sup>36</sup>, take the form of explicit concepts used to help the novice appreciate the expert's tacit knowledge. Ideally these bridges should be negotiated through a

<sup>36</sup> described in section 5.4.3, p125.

process of reciprocal reflection: where the expert offers a bridge, the novice performs on their understanding of the bridge (exploratory indwelling), the expert reflects on the novice's response and considers revision of the bridge until the two are in accordance.

However, findings from the research suggested that, over the long term, the craft experts had a tendency to become fixed in their perception of their practice. They were dwelling in their craft but, perhaps because they had limited experience of teaching or perhaps because they did not have a wider community of practice, they ceased to 'break open' their tacit knowledge and then re-interiorise it. Equally, the novices could have a tendency to be reluctant to learn by imitation, perhaps because they were used to more constructivist forms of education, so such reciprocal reflection could easily fail to take place.

The proposed role of the designer-researcher is to help overcome these problems by assisting both novice and expert. Firstly through engagement with the expert practitioner to stimulate some breaking open and re-interiorisation of their craft skills to discover possible bridges to their tacit knowledge. Secondly through helping the novice to overcome the barriers to imitation by offering an interactive resource that should appeal to the constructivist, but also provide the explicit bridges that could help speed up the learning process by supporting their reflection on action. It would also offer the more advanced learner a rich source of material to draw on to develop their craft skill once they had the ability to generate their own interpretation.