VOCATIONAL TRAINING AND KNOWLEDGE DEVELOPMENT: A DEEPER UNDERSTANDING

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Construction management research literature has identified the importance of understanding the practical realities of skills and training provision and the role of reflective practice in the development of knowledge. This paper examines vocational training of experienced site staff in the development of their knowledge through SVQ training to investigate the primary factors for successful learning in site-based construction staff with a supervisory/management role. Using semi-structured interviews the impact of vocational training on individual candidates and other site-based staff are investigated. The paper explores, through the reflections of 26 SVQ candidates (20 SVQ3 and 6 SVQ4), a deeper understanding of how site supervisors and site managers learn through the SVQ process and develop tacit knowledge through formal reflection. Reflective practice develops practical wisdom (Phronesis). The investigation explains aspects of practical wisdom and how knowledge, practice and skills are developed through vocational training. There is a clear perception by those completing the qualification that it has enabled them to perform their job better identifying numerous examples relating to problem solving, critical thinking, making decisions and leadership. It has been found that Phronesis is evident on a day-to-day basis on site activities developed through reflective practice in personal development. The reflective practice in developing knowledge also builds, within individuals, a better understanding of themselves and their capabilities through the learning achieved in the SVQ. Future work is identified around analysing the role of the assessor in facilitating Phronesis in the SVQ context.

Keywords: learning, Phronesis, tacit knowledge, vocational qualifications

INTRODUCTION

A number of authors have explored issues around skill shortages and employer based skills development in construction (Raiden and Dainty 2006; Clarke and Herrmann 2007; Chan and Moehler 2007) and related areas of the employers role in skill development, vocational skills development and workplace informal influences on skill development. Moehler, Chan and Greenwood (2008) identified the trend towards work based learning through NVQ and suggest a movement of organisations playing a greater role in engaging with skill development. Cano Lopez, Copping and Bullock (2008) explored onsite training and assessment where learning takes place in the workplace and is assessed through observation and questioning to develop effective strategies for integration into organisational practice. These previous authors

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considered theories of learning and this paper extends this work towards the concepts of practical wisdom and knowledge, how knowledge and skills are developed through vocational training and tacit knowledge development is prompted through formal reflection. Since 2010 there have been 239 experienced site supervisors, site managers or construction managers that have successfully completed a Scottish Vocational Qualification (SVQ) with RT Resources. Vocational qualifications are much more than a "young person's apprenticeship" or a training course. The higher level SVQ awards equate to levels 7, 9 and 11 on the Scottish Credit and Qualifications Framework ranging from level 7 for SVQ3 comparable with first year of university through to level 11 for SVQ5 equating to post-graduate study.

Praxis is a term used by researchers in educational learning and writers link the term to the work of Freire (1972).In practice the term praxis does not have everyday use, but the reality is that in many professional contexts (e.g. HEA teaching development; ICE and CIOB professional development for Chartered status) practice is a simpler, more basic derivative of what praxis actually means. It would appear that Freire is a typical starting point for researchers on the subject (Beckwith, 2015; Smith, 1999, 2011), quoting Freire (1972) indicating the problems for those facing a highly theory based education for a vocational career. Smith (1999, 2011) goes on to explain how knowledge can be categorised as theoretical (such as with pure maths), productive (as in building) and practical (social work training). This is developed further as Smith then presents the productive disciplines can be associated with Aristotle's form of thinking called poietike in relation to the work of craftspeople or artisans; indicating that praxis is guided by a moral intention (Aristotle, 2004) to do the right thing with a view to furthering human well-being. In this context this is what the Greeks called phronesis; necessitating an understanding of people (and one-self) and has been described as practical wisdom (Smith, 1999, 2011).

Reflection on experience has been advocated as a way to facilitate experience-based learning. Mathew and Sternberg (2009) define reflection as a process of guided critical thinking that directs attention selectively to various aspects of experience, making knowledge typically acquired without conscious awareness explicit and available for examination and modification, hence developing practical wisdom.

Phronesis and tacit knowledge

Experience is built over time by individuals and organisations working in and developing an understanding of the Construction Industry. Intuition is the acknowledgement of "gut-feeling" which is often rooted in experience and that much of the knowledge that is relevant to competent performance is not openly expressed or readily stated. Research on expertise in a variety of domains supports the notion that much of the knowledge associated with successful performance is tacit (Nonaka, 2005). To succeed in organisational environments professionals must enhance their capacity to learn from experience and adapt their modes of practice accordingly (Mathew and Sternberg 2009). Experience based knowledge is context-dependent and typically develops over time through an iterative learning process of perception, action, and feedback. Developing methods to enhance the acquisition of experience-based knowledge have never been more relevant to professional education and development (Mathew and Sternberg 2009).

Michael Polanyi wrote in The Tacit Dimension, "we can know more than we can tell" (Polanyi 1967, 4). Work by Nonaka (Nonaka and Takeuchi 1995; Nonaka 1998) stated that there are two types of knowledge, Tacit and Explicit. Explicit knowledge

is "formal and specific…it can be communicated and shared" (Nonaka 1998, 27) Zack (1999) defines explicit knowledge as knowledge which can be precisely and formally articulated, easily codified, documented, transferred and shared. Egbu (2006a) proposes that a great deal of knowledge for addressing challenges within the urban environment is tacit in nature. Anumba, Egbu and Carillo (2005) identify the opportunity for knowledge production, transmission and transfer between different professionals in the construction industry. However, tacit knowledge, which is deeply rooted in action and context, can be acquired without awareness and is typically not articulated or communicated. Tacit Knowledge is defined by Nonaka and Takeuchi (1995) as: "highly personal and hard to formalise, making it difficult to communicate and share with others". Subjective insights, intuitions, hunches all fall into this category of knowledge. Furthermore, tacit knowledge is "deeply rooted in an individual's action and experience, as well as the ideals, values, or emotion he or she embraces" (Nonaka and Takeuchi 1995, 8). Nonaka and Takeuchi (1995) further split tacit knowledge down into two parts, a technical dimension and a cognitive dimension. Technical dimension encompasses the knowledge gained through experience, whereas the cognitive dimension is based on the individual's belief and how they perceive the world. Tacit knowledge is "what the knower knows which is derived from experience and embodies beliefs and values" (Marwick 2001).

Cianciolo (2006) defined tacit knowledge as the generally unspoken knowledge gained from experience (as opposed to explicit instruction), which distinguishes between expert individuals in a particular domain. Practical intelligence therefore can be viewed as developing expertise (Sternberg, 1998), and tacit knowledge its manifest indicator (Sternberg *et al*., 2000). Tacit knowledge has been recognized as both an outcome of experience-based learning and as a basis for continuous learning (Sternberg & Horvath, 1999). Expanding the theory of the knowledge-creating company (Nonaka and Takeuchi, 1995), Nonaka and Toyama (2007) propose a view of strategy as distributed phronesis, using Aristotle's concept of phronesis, which translates roughly as "prudence," "practical wisdom," and "practical rationality, in which human values and ideals are inherent.

Nonaka and Toyama, (2005) believe phronesis is an illuminating description of knowledge creation. The concept of phronesis originates with Aristotle where he distinguishes between three types of knowledge: episteme, techne, and phronesis (Flyvbjerg 2001). Kinsella and Pitman, (2012) describe Phronesis is an intellectual virtue, incorporating prudence, ethics, practical wisdom or practical rationality takes into account contextual circumstances. Nokayan and Tokana (2007) identify phronesis as the high-quality tacit knowledge acquired from practical experience that enables prudent decision-making and action appropriate to each situation, guided by values and ethics.

Birmingham (2004) identifies reflection with the classical moral virtue of phronesis by merging contemporary work on reflection in teaching with philosophical work on phronesis. The article concludes with an account of the value and utility of conceptualizing reflection as phronesis. In an educational context, Kessels and Korthagen (1996, 19) explain that phronesis has to do with "the understanding of specific concrete cases and complex or ambiguous situations". Episteme in the form of educational theory can inform phronesis, but phronesis is not the simple application of educational theory, for educational situations are much too complex, ambiguous, and unpredictable (Birmingham, 2004). The knowing and thinking that phronesis requires a context and represents Schön's (1992) work on reflection, in which the

terms knowing-in-action, reflection-in-action were developed. The importance of learning is recognised by professionals and organisations as a part of maintaining competitive advantage (Bhargav and Koskela 2009). The benefits of vocational and work-based learning are obvious, when people learn by doing as well as by thinking, reading and writing they develop skills, competence and knowledge that may be partly evidenced through reflection, reflection-in-action as conceptualised in Figure 1.
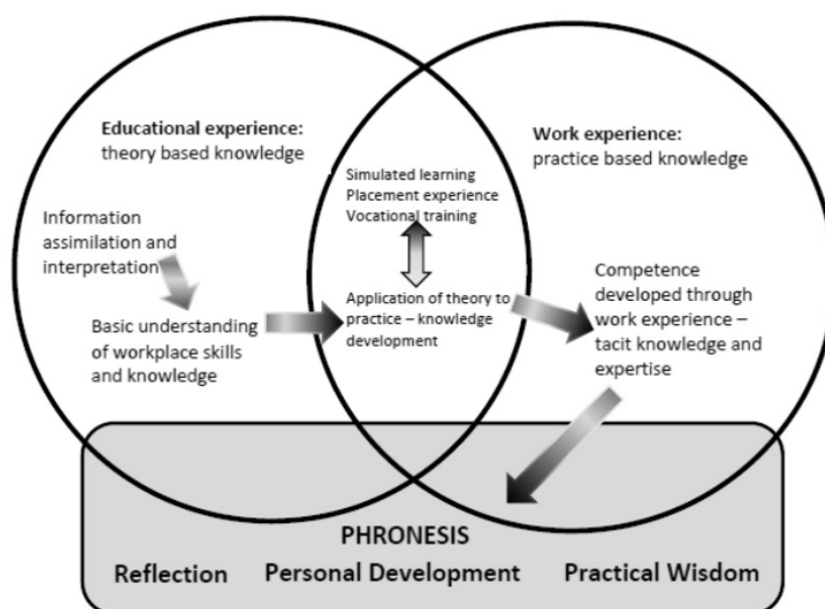

Figure 1: Developing Phronesis

RESEARCH METHOD

This study investigates the role of vocational training and reflection in knowledge development to explore two themes: 1) how knowledge and skills are developed through vocational training and reflection; 2) how SVQ candidates turn their learning into practice and tacit knowledge and the concept of practical wisdom gained.

RT Resources have trained 239 candidates since 2009 completing their SVQ award successfully (SVQ3 Site Supervisor = 131; SVQ4 Site Manager = 92; and SVQ5 Construction Manager = 16). Semi-structured interviews were adopted to enable a deeper understanding of the candidate experience and the learning process upon the individual, their workplace and those with whom they work. The task in the semi-structured interviews was to discover as much as possible about how site based supervisors and managers learn. Semi-structured interviews, the most wide-spread research methodology in qualitative research (Dawson 2002), commenced by asking indirect questions and then explored specific issues. This methodology provides the interviewer with the freedom to probe various areas and to raise specific queries enabling the ability to probe the unknown. The purpose of the interviews was to find factors that explain the learning processes in vocational training that may help develop an understanding of how tacit knowledge is developed within site based supervisors and managers. The research team used thematic analysis (Braun, V and Clarke, V, 2006) to analyse the interview data and through codification assess meaning and frequency in context (Joffe and Yardley 2004).

Knowledge development through vocational training

The themes arising from the sample of 26 interviews showed no difference between the 20 candidates for SVQ3 and 6 candidates for SVQ4 other than the matter that for professional development/self-improvement the choice at SVQ3 level was led by the candidate and at SVQ4 level the employer organisation tended to make the learning a requirement for developing within the role. The themes arising from the analysis have been grouped into 6 theme categories. They are presented in Table 1 alongside theory from literature as discussed in the previous sections and conceptualised in Figure 1. The themes identified during interviews fit well with components of Phronesis and reflection.

Table 1 Themes arising from analysis

Theory	Theme from interviews
Phronesis	Working better with people: improved team results and better leadership skills (through knowing how to communicate effectively, through listening and giving feedback with empathy to make better decisions and through being respected and asked for advice/suggestions).
Phronesis	Self-improvement for career/professional development: drivers include peer pressure, employer expectations, progress towards CSCS card and personal motivation. Perceived benefit of additional respect from peers and supervisors for completing the award.
Reflection	Lack of time: work on the SVQ limited with candidates expressing the desire to spend more time thinking about the assessments and completing them.
Phronesis	Improved knowledge and understanding: of people, processes (better planning and record keeping consistent specific examples), current and innovative technical information and construction techniques.
Reflection	Reflection or 'thought': Prompted by assessors as a formal action to examine depth of knowledge in articulating justifying decisions; answering the 'why' one solution was better over any other. Also evident as an informal learning experience through interaction with peers when explaining problem solving on site-based issues requiring candidates to draw upon previous experience/knowledge and other sources in creating 'new' solutions. Several participants commented on the difficulties in articulating their thinking within personal statements based on personal skills - most participants indicated improvements in communication as part of the benefits of completing the award including all those that indicated they had difficulty in articulating how they thought.
Phronesis	Recognition by others for achievement: gaining respect from peers and seniors with a perceived increase in being specifically asked for advice/solutions to problems and included in more complex decision making

In addition to the theme identification, interviews explored the process of reflection. Research investigating vocational training and labour market education has shifted focus from education and teaching to learning and/or competence development; with the interest in vocational training identifying workplace learning, work-based learning or work-related learning as the context (Illeris, 2003). It is within this context that the process of reflection can be identified as a part of embedding what has been learned through a self-critique of past events, learning for the future as a part of self-development. Reflection does not have to be formal with assessors to prompt the self-reflection required for personal statements and evidence for the SVQ award. Reflection can also happen during discussions and deliberations when, for example, faced with problem solving under circumstances with which a candidate is not yet familiar. One example cited by a candidate included supervising a team responsible for fitting sun-pipes for the first time where the drawings and design information were ambiguous for the purposes of fitting correctly and the supplier instructions were

helpful but not as complete as to be entirely useful for the task for someone doing this for the first time. In this situation several people discussed the problem and pooled their collective knowledge. Based on their previous experience in problem solving and understanding how others outside their problem would not engage they examined other avenues in the absence of further information from the supplier and designer. The team, by the end of the discussion had a working plan to get the job done without any further delay.

On completion of the first finished attempt they all had a discussion on how it had gone and with minor alterations had identified some changes to simplify the process of fitting the remainder of the sun pipes. This process of reflection and problem-solving has been a typical 'tried and tested' approach to dealing with innovative problems to keep project work on target for site-based staff. It inevitably requires a team approach and the team will not articulate their knowledge without specific reason, in this case, SVQ assessor asking candidate to reflect on their personal problem solving skills, personal contribution to team success and their own personal development. The candidate had to then articulate this example in their assessment evidence for the assessor writing a reflective personal statement, thereby learning more about themselves. It could be argued that in the tripartite model of knowledge transfer this example demonstrates each of the concepts of knowledge, social network structure and trust in relationships (Butler *et al.*, 2007). This task being complete, the knowledge the site supervisor and the team had gained was not written down anywhere (no practical reason to do so) and no changes to drawings or supplier instructions arose from the problem that was solved; therefore this 'knowledge' was then embedded in the memories of those involved for any future use and was only evident when asked to reflect upon recent problem solving examples for the purposes of SVQ assessment.

In every case the individuals were personally motivated to succeed and had either identified the appropriate opportunities themselves or by the company and provided with the necessary resources to support their personal development with the exception of the belief that there was a lack of time, confirming the underpinning motivational drivers for successful learning (Seward 1952).

DISCUSSION

Candidates for SVQ awards vary in length of experience prior to undertaking their award and it is possible to make the assumption that length of service in any kind of supervisory/management role correlates with the level of accumulated knowledge. This issue was examined in detail (Armstrong and Mahmud, 2008) and the results of their study successfully refuted any correlation between the duration of experience and accumulated tacit knowledge and confirmed that how people learn from experience is of greater influence. Discussions with candidates prior to starting their awards to assess their readiness for the SVQ and to determine the appropriate level of study for their existing experience and ability to produce evidence confirm this finding; there are other variables that have more impact on accumulated tacit knowledge other than duration in any particular role.

Previous studies (Garrick, 1998; Boud, 2003) suggest that informal learning and interaction with peers have more impact than formal training, which is perceived by them as having marginal impact. Whilst we recognise that the analysis shows clear evidence in the themes of team-working supporting the essential role of interaction with peers that the formal training was an essential element in the learning process

when reflection revealed improvements in record keeping and planning as well as communicating and working better with others. We would argue that the intervention of assessors, for example, in the formal training towards the SVQ award process for site supervision and site management, has not been fully recognised in these studies as a catalyst for learning through reflection with the additional requirement of articulating this in either verbal responses to the assessor or written statements to demonstrate competence. Candidates within the SVQ process for site supervision and site management appreciated how their knowledge, through the award, had been broadened to help them better understand their role and working environment and the ability, with a depth of knowledge, to make more effective decisions.

The SVQ assessment process, due to the experience of assessors and the assessment framework, encourages candidates to reflect on their learning and decision making processes to ensure that candidates can articulate their knowledge. It is argued that tacit knowledge cannot be captured, translated or converted and can only be inferred from actions and statements (Tsoukas, 2002; Armstrong and Mahmud, 2008); observation of working practice is a part of the assessment of the SVQ. The SVQ award provides a means for a candidate to evidence knowledge through, for example, reflective writing in their numerous personal statements, responses to questions from assessors in interviews/viva and observation by the assessor of the candidate at work. In our experience the intervention of the assessor is an essential part of the learning process. The assessor observes the candidate at work to use observation to confirm competence and inform discussion surrounding decision-making and problem solving to prompt the candidate, where required, to reflect upon and then articulate how they know what they know to be an appropriate and successful way of doing things on site.

The research identified the key role of reflective discussions on learning achievement based on developing new knowledge required to achieve the SVQ site supervision, site management and construction management qualifications. There is formal reflection with the assessor for specific assessments to articulate justifications in support of decisions made and informal reflection with colleagues as part of problem solving. Where the assessor is involved the process could be described as a form of knowledge transfer where the more experienced assessor uses their knowledge to encourage the candidate to seek answers to questions in a range of ways to demonstrate they are competent. How candidates learn is then internalised through repetition and familiarity for certain tasks, through reading and discussion for new information and through reflection when trying to understand the importance of the new information. It is possible to distinguish these two types of learning that appear to be taking place on sites; deliberative learning when the focus is towards SVQ achievement and time set aside for that purpose (Eraut, 2000) and implicit learning where there has been no deliberate attempt to learn such as learning through problem solving (Reber, 1993). Individual learning for site supervisors and site managers in the SVQ process is contextualised and that intuition forms part of developing the expertise required of the individual, confirming the observations of Farrar and Trorey (2008) in their study of vocational learning in dry stone walling. The reflection process helps site based staff transform new information into personalised knowledge when they reflect on what this information means for their understanding of how they currently do their job and tasks and what this new knowledge can mean. It could be argued that the process of reflection is where the distinction between knowledge of the world (know-what) and knowledge in the form of skills and competence (know-how) takes place (Johnson *et al.*, 2002).

Prior to taking on a leadership role candidates could rely on others leading them to put forward ideas and solutions allowing them to avoid having to think critically or justify a decision; and in this, usually passive role prior to taking responsibility for leadership, they do not feel any ownership for a decision if things go wrong even if they had the ability to question and challenge the decision. When asked why a passive attitude was adopted prior to engaging with the SVQ it is attributed to previous negative experience (whether real or perceived) in challenging decisions of supervisors/managers - reinforcing in some people a negative learning behaviour that 'even if you know better, say nothing'. Taking on a leadership role requires greater thinking about all sorts of decisions and given the accountability for decisions the focus of SVQ candidates on pre-empting potential problems to reduce the consequences of making a poor decision. The interviews identified evidence of an attitude shift away from blaming people for failure within a working site environment towards recognition of learning from situations where things have gone wrong to avoid repeating mistakes in the future. Candidates are aware of being judged by others in the working environment all the time in doing their job by both peers and seniors, including making sound decisions consistently and reputation was cited as an important aspect of professional capability and recognition for candidates.

During the SVQ process assessors not only cover technical questions but use their experience to get candidates to think about how it felt when they weren't listened to by supervisors and to remind them that everyone is always learning, including them as supervisors. Several candidates cited that their personal listening skills and teamwork improvements related to a better understanding of why this is an important issue for leadership and team development with examples of improvements on site related directly to this factor. Assessors have the experience of the workplace to know that listening is an important skill to learn for a site supervisor and site manager so that if one of the team disagrees with a decision or the way something is to be done the supervisor could explain their decision fully. In this way other people can understand the rationale for the decision; thereby helping everyone to learn more through the decision-making process.

CONCLUSIONS

This study has investigated, through 26 semi-structured interviews, how site supervisors and site managers learn through the SVQ process. The investigation explains aspects of how knowledge and skills are developed through vocational training in addition to informal methods such as problem solving and colleagues. It has been found that Phronesis is evident on a day-to-day basis on site activities developed through reflective practice in personal development. It has been found that during the SVQs individuals have stretched themselves to realise greater achievements; the reflective practice in developing knowledge builds, within individuals, a better understanding of themselves and their capabilities. There is a clear perception by those completing the qualification that it has enabled them to perform their job better identifying numerous examples relating to problem solving, critical thinking, making decisions and leadership. There is scope to investigate further the role of the assessor in the learning process. The mentorship of experienced assessors appears to be an essential part of developing tacit knowledge and reflective practice in developing practical wisdom; it is proposed that this factor may be explored in more detail in future work.

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