Philosophy in Construction:
understanding the development of expertise

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Construction appears to have nothing to do with philosophy as it is a practical activity. This paper introduces a project funded by the UK, Arts and Humanities Research Council, that has supported a philosopher in residence in three construction companies. The project has taken up the challenge of the philosophy of practice focussing on the study of expertise. This philosophy has its conceptual roots in the work of Dreyfus, Heidegger and Aristotle but extends other work in the construction industry on knowledge management, experiential learning and radical education. This is of vital importance in an industry that is continually being directed theoretically to improve practice. Critical dialogue has been used as a therapeutic tool (in a Wittgensteinian sense) by seeking clarity in explanations of practice to value the actions of practitioners individually and in teams. The research has involved working in critical dialogue with trades-people, professionals and managers. The paper reports on early results exploring the development of expertise in novice through to experienced practitioners exposing issues for education to address around the handling of incomplete knowledge in contexts.

Keywords: improvement, practice, situational learning, expertise-in-context

Introduction

Construction seems to be the most distant of any discipline from any notion of philosophy. Philosophy asks basic question such as 'why' and engages in a rigorous process of inquiry about the way we think and act in the world. In the project, that we describe here, we have met people from carpenters to senior managers who also ask deep questions and seek strong explanations. So maybe we in construction just pretend it is all about getting our hands dirty and getting the job down without thinking. In reality we are all philosophers as many a banter on site alludes to. In the face of this, the creation of a project which reveals the philosophical aspects of construction and sees it as a tool of industry development is not that strange, even if the presence of a professional philosopher in the team as a productive member may still be a long way off.

The project involved having a Philosopher in Residence in three construction companies to engage in critical discourse about practice so as to improve the individual practitioner's and the company's practice thus providing economic, social, and cultural benefits. The companies were Mouchel, Thomas Vale Construction and Rider Levett Bucknall. Mouchel are an international civil engineering and public infrastructure management organisation employing nearly 11,000 people. Thomas Vale Construction is a medium sized building contractor operating in the UK Midlands employing about 830 people. It has a strong record of partnership working in both the public and private sectors. Rider Levett Bucknall are a multi-disciplinary consultancy offering cost and project management services with 2000 people worldwide. The question about the nature of practice and expertise takes much of people's attention both positively in the sense that we like to tell people about how well we have done but also negatively in how it all goes wrong. The philosophical concepts behind this involve expertise-in-context which is everyday expertise understood broadly as covering various kinds of practical knowledge, attention based knowledge, skills, decision making and action planning (Dreyfus 2005).

Thus the project aimed to:
1. determine the therapeutic and diagnostic role of expertise-in-context ideas in improving construction practice.
2. facilitate the development of better models of practice by thinking differently about knowledge and skills. This will allow more flexible decision making that reflects individual expertise.
3. disseminate the economic, social, and cultural benefits of the use of philosophy to a non-academic audience.
4. analyse the relationship between theory and practice within practice and philosophy.

5. explore how ideas get embedded in company structures and processes.

The project involved three stages with a total of 30 practitioners including trades-people, professionals and managers. The first stage introduced the language and concepts of expertise-in-practice to the participants and explored methods of working in dialogue. The second stage worked closely with practitioners on their own real world perceptions in a therapeutic and diagnostic manner using a critical dialogue technique. The final stage involved exploring with groups of practitioners how such techniques can be used to develop the company processes.

Construction is a rich environment displaying the use of 'expertise-in-context' at a variety of levels in very intense and unique situations. It is in exploring this that we believe there is value to individuals and to the companies that we are working with. The fact that construction is often presented as not operating effectively gives the project and construction an additional challenge. Those operating in it mostly do not actively seek failure and believe that they are performing a good job. Practice is based on this knowledge of the world, however, practitioners are continually being told to modify their knowledge and thinking to change practice in construction. Everyone knows it is not that simple but we continually pretend that it is (Boyd 2007). The problems with construction industry do not lie in the practices themselves but in the conventional expression and analysis of what these difficulties are. Improving practice requires a different kind of expression and analysis with expertise-in-context based language and concepts providing this as they align with actual practice. The therapeutic and diagnostic application of these ideas in a Wittgensteinian fashion (Addis 2006) can release practice from its self imposed conceptual problems.

The companies had agreed to allow groups of staff to participate in this research as an organisational development activity. Each of the companies was seeking to improve its economic performance in the short term and also to make itself sustainable in the longer term. They all identified a need to change but were baulked by the need to deliver business in tight timeframes and by past industrial practices. Therapeutic philosophical techniques enable the loosening of preconceptions whilst diagnostic ones expose unexamined assumptions and consequences. Thus, taking individual's actual experiences of practice can help them to expose faulty and inadequate assumptions about knowledge and to identify organisational contradictions in structure and processes. This project enabled companies to reflect on their approaches thus providing ideas for improvement that can be embedded in their structure and processes.

The project activity has aided company staff in recognising their own expertise-in-context including diagnosing limitations to their knowledge and work context. The staff now understand, value, and can communicate their expertise more clearly to a wider public, thus presenting a better image of the construction industry which can attract top quality entrants and improve retention. Organisations also understand better individual staff contributions and their needs for motivation, development, and respect. These processes facilitate sustainable evolutionary change from within so that ideas get embedded in company structures and processes. In the long term, staff need to change companies so they align with improvements in practice, assisting colleagues through therapeutic and diagnostic tools to engage with effective change.

At the same time, the project will challenge philosophy to provide an articulation which can be appreciated in non academic environments. It will also help academic philosophy to develop case material in practical environments. It is hoped that this will bring practice fully and squarely into the limelight and re-valuing it in the world.

The research methodology is explicitly phenomenological as it is working with practitioners' perception then interpreting from these (Easterby-Smith et al, 1991). Indeed phenomenology is one of the philosophic roots of expertise in context where the study is of the perceived realities of activities (Heidegger 1975). This process can involve the generation of different theories from the different views of the same phenomena. This is social constructivist view of the world (Easterby-Smith et al, 1991) and so objectivity and value neutrality are unavailable in research as it is in practice. In this, the research aims to help practitioners and academics in their thinking about practice thus involves Action Research which sees the planning and implementation of change in the real world as critical to its process (Susman and Evered,1978). The work is also participatory in that the subjects of the research are encouraged to direct the study for their benefit (Heron 1988).

This paper describes the roots of this experience-near engagement with practice in earlier work on knowledge management, experiential learning and radical education followed by further explanation of the expertise-in-context

philosophy. Early results from the project are presented that demonstrate the way novice and expert practitioners cope with the world differently with a conclusion about the implications for education and learning in practice.

Knowledge Management and Education

This work with experience-near accounts of construction practice has its roots in running innovative masters courses in construction (Boyd and Wild, 1993; Boyd 2006). These courses were radical in the sense that they challenged conventional construction education practice, starting from the real experience of construction, rather than presenting idealised academic solutions, in order to challenge the way students thought about problems. The conventional conception of construction practice assumed a stable industry where superior technical knowledge held by an individual could ensure success and overcome problems (Boyd and Wild 1993). In this conventional view, solutions involve a better statement of objectives, better planning and better implementation processes. Thus, education involves transferring technical skills and techniques from an expert teacher and from past projects to a student.

This approach based on superior 'technically rational' knowledge was considered no longer viable because knowledge was not fixed. The industry (along with most other industries) was unstable (Boyd and Wild 1999). The complexity of projects meant that no one individual could understand all technical details and knowledge was held diffusely within the project organisations and deep down away from the power and authority (Boyd and Wild 1993). There were multiple perceptions within any project and the resultant value conflict were legitimate (Boyd and Wild 1996). Uncertainties within the environment of the client and project organisations cause uncertainties in the project itself (Boyd and Wild 1999).

Practice, therefore, and the education of practitioners, needed to be seen in a new way and this was embedded in the courses (Boyd and Wild, 1993). Practitioners work was seen as a coping engagement with a complex, uncertain and conflicting world and involved four dimensions as shown in Table 1.

Table 1.
The Dimensions of Practice (Boyd 2006).

Action/Knowledge	Rational	Non-rational
Outward focus	Technical knowledge and procedures	Skills, tacit knowledge, Intuition
Inward Focus	Values and beliefs	Fears, compulsions

Knowledge is both rational i.e. that which can be made explicit and codified, and non-rational that which cannot be described in words or understood (Boyd 2006). Action involves the working with this knowledge both outwards on the task and with people and inwards with oneself. Clearly the inward activity affects the outward activity and vice versa. This model explicitly acknowledged the non rational and emotional thinking which was later explained through expertise-in-context.

Fundamentally the courses started with the knowledge that the students had. The students were engaged in exploring this knowledge; firstly to appreciate it in context, then for them to critique this and finally helping them find ways of developing new knowledge. The work of Kolb et al, (1986) and Schon, (1985) were especially important in both identifying the need for reflection as well as experience in work and learning environments. The courses were regarded as action research projects (Boyd and Wild,1994) where the staff were also engaged in learning and research at the same time as the students. The courses encouraged the notion of learning with others as a fundamental skill in an industry based on teams (Boyd and Wild 1996). A learning approach saw past projects only as sources of learning not as solutions to be replicated (Boyd and Wild,1996).

The outputs from the courses both in student development, the development of their organisations and in research were significant. Many papers were published jointly with students that explored the real nature of the industry. One of these devised a new method of knowledge management (Boyd and Robson, 1996) that mirrored the course ethos based on practitioners exploring their problems on site. A project involving nine construction companies, industry bodies and another University was instigated funded by the UK Department of Trade and Industry that demonstrated the opportunities of the method that was called Knowledge Event Management (KEM) (Boyd and Xiao 2006). This method used simple tools of audio diaries and debriefing to capture, transform and disseminate rich knowledge. Debriefing was taken as a sufficiently formalised technique of dialogue to be useful in this approach. Originally, debriefing was a term in military campaigns, which was used to determine what had occurred and to develop new strategies from the experience (Pearson and Smith, 1985). In the project debriefing refers to a purposeful reflection in a social interaction, which assists learners to develop generalisations and to transform experience into learning. Debriefing was found to be a powerful tool, which could make explicit the tacit learning (Baumard 1999) so that it could be transferred to a wider audience and ultimately to the knowledge base of the industry. Debriefing also revealed more indeterminate knowledge such as intuition which allowed the practitioner to integrate isolated bits of data and experiences into an action picture almost instantly. The power of debriefing to work with practitioners meant that it was the ideal tool to be developed to explore expertise-in context.

This KEM approach focused on the way practitioners think during Events rather than just determining what they knew. This challenged how important knowledge in the form of facts and menu's of solutions was in environments, like construction, where managers have to handle complexity, uncertainty, ambiguity, value conflict, crisis and change. Practice knowledge is not generalisable like abstract knowledge because it is context dependent. It consists not of knowledge that is theoretical, but rather knowledge of "how to do things", and "what is the right decision in this context". (Horvath et.al. 1999). One of the developing areas from this is the way practice handles 'incomplete knowledge' which was addressed further in the philosophy project.

Overall, this earlier work identified deep problems in theoretical understandings of knowledge and of practice which would benefit from being addressed by a philosophical approach and this became one of the drivers of the philosophy project.

Expertise-in-Context

Expertise-in-context seeks to understand everyday expertise, skills, decision making and action planning (Dreyfus and Dreyfus,1986). It applies to such refined skills as music but equally to everyday skills such as making a meal. Work on expertise-in-context involves investigations into the contextual interdependent nature of consciousness and action. Heidegger (1997) and Aristotle (2000) claimed that practical knowledge is a kind of expertise acquired as a second nature. Their idea was that once one becomes sufficiently expert at something there is a sense in which it becomes natural. Indeed, it becomes more to do with how one responds to a situation both in appreciating the nature of it and effectively acting in it that is important rather than what one knows explicitly or rationally about ones thinking. It is when one goes beyond thinking that true expertise is demonstrated. Expertise-in-context involves the idea of articulating smooth coping non-deliberative behaviour, and the non-conceptual and embodied character of expertise. It relies on a rich perceptual repertoire which consists of the capacity to respond to subtle differences in the appearance of a wide variety of situations but it does not (primarily) require a repertoire of reasons at all. Expertise is a matter of discriminating perception which requires an appropriate response to the richness of the context. This permits the successful intuitive situational response that is the hallmark of expertise.

Heidegger (1997) and Merleau-Ponty (2002) suggested that one is always involved in a world organised in terms of one's body and interests thereby the world is permeated by relevance to us personally. In the case of expertise features of the situation although accessible to the perceptual system are not required to be accessible to the mind. Phenomenology suggests that a study of expertise shows that identifiable features have no relevance to the current state of mind of the expert when acting. There need be nothing in the situation which is identifiable and thinkable as a reason for acting. In expertise-in-context there is a direct link between perception and action as opposed to the view that there is perception followed by cognition then action (which is often associated with the tripartite analysis of knowledge). Consistent with the expertise-in-context position is that understanding is required to perceive. Thought and perception have equal weight. Expert perception in any skill area including ordinary life has an intentional or goal directed content alongside any conceptual content there may be.

Formal instruction may begin with rules but these rules appear to yield to increasingly flexible responses to situations as expertise increases (Dreyfus 2005). Thus, instead of a reliance on rules for taking decisions or justifying actions, expertise directly responds to a particular specific situation. For experts, rules become second nature but function in the background when skilled coping occurs. Rules only guide action and thought in this sense. Experts may make decisions which are wholly intuitive and not in accord with any predetermined plan. In such instances, the expert may be unable to reconstruct a reasoned account of the actions taken since none exists. What this suggests is that the expert has ceased to rely on general rules. On this analysis gaining expertise requires one to move from situation independent rule-following to a more engaged and situation specific way of acting. Experts can usually be prompted to remember or acknowledge rules when asked about them. It follows from this that if an expert is asked for reasons that produced a particular action the response given will be a retrospective rationalisation that will indicate that the general rules followed as a learner can be recovered from memory. If this is correct then following a reconstructed rationalisation by an expert could not produce expertise.

Dreyfus and Dreyfus (1986) represented these ideas in the form of a five stage model of skills acquisition. They state :

"Rather than adopting the currently accepted Piagetian view that proficiency increases as one moves from the concrete to the abstract, we argue that skill in its minimal form is produced by following abstract formal rules, but that only experience with concrete cases can account for higher levels of performance."
(Dreyfus and Dreyfus 1986)

The model stages can be summarised as follows
1. **Novice:** has a rigid adherence to rules and no discretional judgment
2. **Advanced beginner** has perception of the situation but this is very limited and, although the quantity of areas of knowledge has increased, still treats individual tasks separately and gives them equal importance.
3. **Competent** starts to cope with the complexity (quantity and uncertainty) of the situation in a way that action involves integrated and longer term goals.
4. **Proficient** has an holistic view of the situation, rather than just seeing aspects and can identify what is most important in a situation.
5. **Expert** has very little need for rules (although can talk about them) as has an intuitive appreciation of situation from which can determine what is possible to achieve almost instantly. (Dreyfus and Dreyfus 1986)

This work has been used most extensively in the study of nursing practice Benner, (2004). However, construction is also a rich environment displaying the use of expertise-in-context at a variety of levels in very intense and unique situations. The philosophy research project has worked with practitioners to develop an expertise-in-content based language and concepts to articulate knowledge, skills, and expertise in a way that values actual practice. It has then gone on to examine ways of embedding expertise-in-content ideas in organisational structures and processes to help remove engrained contradictions to ensure long term organizational sustainability.

Results

What is presented here is an initial analyses of some of the conversations about expertise. In particular we are demonstrating the applicability of the Dreyfus model in construction that Benner (2004) undertook for nursing.

The novice has no experiential background to appreciate situations nor to find approaches to handle them effectively. The following is typical:

The site manager who worked for the main contractor actually thought that I was an architect, and started to ask me questions about the drawings and plans for the project. I had not had any previous experience reading drawings and the questions he was asking were of a technical nature, in particular relating to internal walls which had to be taken down and whether they were load bearing or not. This put me in an awkward position because I was supposed to be advising on the client's behalf and I basically could not give any straight answers……I ended up saying that I

needed to get further advice from a structural engineer. Looking back, it was a relatively simple project and there was no need to get a structural engineer involved. ………. it must have looked very unprofessional.

The lack of skill affects the way that novices use time and prioritise actions for example:

An incomplete drawing package was issue by the design company to the principal contractors three weeks prior to the starting on site. I had two other jobs on site at this time and one other job to detail. I choose to put the other jobs before this one, as I believed that the contractor would be able to complete the job…………. without the additional information. We finally issued the complete drawing package to the contractor one-week into the job. The implications of an incomplete drawing package affected the works program, which resulted in conflict between the design company and principal contractor. This ultimately affected on the quality of the handover.

The relationship of novices to others is very difficult; in particular when a young graduate site manager deals with older trades-people. The novice has role power but does not have expertise or respect. Both recognise this.

The updated lighting plan showed some new proposed fittings, and some of the existing proposed fittings relocated on the designer's request. This had time implications to both the electrical contractor and the decorators. The electricians had already put the new light fittings in place, therefore to relocate them would require creating a new hole in the wall or ceiling for the new fitting and also in filling and decorating the existing holes. The decorators and contracts manager reacted angrily to me announcing these changes………. This became an embarrassment.

It is the nature of some aspects of practice that they rely on rational detail and this can be achieved successfully by novice and advanced beginners;

The reconciliation was time consuming taking 3-4 days (therefore costly) to recalculate previous valuations. I needed to make sure I had all the back up information and thoroughly rechecked the necessary documentation. This was a tedious and boring task which I felt was preventing development in my trainee role, but it was also very important and I felt a sense of responsibility to ensure that the task was seen through to completion with all errors accounted for.

However, the more ambiguous a situation that novices and advanced beginners find themselves in, the less that these codified skills are of any use at all. They therefore need to learn coping skills to handle their lack of knowledge which moves them on to be advanced beginners. In the first case, it is a matter of asking, in the second it is a matter of being honest about the value of the information.

After asking for advice with several queries regarding the electrical maintenance contract, it was highlighted to me technical knowledge comes with experience, and even those that are qualified may not have extensive knowledge in all areas of construction. …. By consulting those that have the necessary knowledge and experience enabled me to overcome knowledge boundaries and progress with the necessary measurements and valuations.

shortly after my boss had gone on leave, the client rang to say he needed the report as soon as possible. As I had never carried out such a report on my own, it was suggested I explain to my client that the report would be delayed and would have to wait until my boss had returned from holiday. However, to do nothing would not have been in the best interests of the client or my company's reputation. I felt it would be letting my boss down, having given me the responsibility to work on the report, and I should use my initiative in his absence. Therefore, as an interim measure I decided to provide the client with a preliminary report based on the information and advice that had been compiled so far. I explained a final draft would be available after my bosses return. Consequently, the preliminary report demonstrated to the client that we made every effort to meet his needs and provided him with sufficient information until my bosses return. An interim measure worked in our favour much more than providing nothing at all.

The latter went on to say in a sophisticated appreciation of their developing skills demonstrating a move to a competent practitioner:

I realised that technical knowledge is not just black and white, that is it should not be assumed you have it or you don't. Learning is a gradient and that which you learn and absorb as you go along can be used for benefit in future experiences

In contrast to these examples of demonstrations of the first three levels of skills acquisition, a senior surveyor demonstrated their exceptional expertise in handling a complex technical and political situation in a tight time frame. It is the situation which is critical here and it is this that the practitioner handles with elegance. The senior surveyor was asked to undertake a building inspection (technical due diligence) of a medium rise office building in a middle-eastern country before a major financial consultancy bought the building for about £7.5M. The situation had many dimensions including that the surveyor's company might take space in the building and had a relationship beyond the consultancy task requested. The surveyor flew out at short notice having only received a visa four hours before his flight and, with a 4 hour jet lag, had to commence work immediately. He discovered that the building was not complete yet, there were family connections involved in the sale and purchase, that the client would want substantial modifications, and that the short time window was connected with desperation in finding a building having been unsuccessful previously because of the different culture of business. Struggling to make sense of the situation but being aware of the time scale, his full expertise resources were called upon. The different cultural situation meant that he was unable to obtain simple information such as drawings and found resistance to questioning about technical aspects of the building. This questioning even upset the professionals and vendor which added to the problem of the situation. Early on, there was a change in time scale from undertaking this in fours days to completing it in three days. But during the second day, this timescale was reduced again to needing completion that evening. It was the fluid and rapid prioritisation of technical and situational factors that allowed an intuitive response which enabled a significant job to be done for the financial consultancy client:

The acid test to me…… was the skill to produce 5 or 6 powerpoint slides that actually hit all the relevant issues……….The final report was probably 40-50 pages long but to be able to … pick out of that in the executive summary(- no client ever wants to read more than a page of A4) – to be able to summarise the nutmegs and filter what is relevant and superfluous is where the skill comes. I have this sense check if I was the client reading this what are the issues…… you have an instinct and you have a feel.

This display of expertise involved a deep appreciation of the context and an ability to modify actions to be successful in context. The expert recognised that this job was just a confidence check for the client and there was no way he was going to understand all the country's codes and building design standards or cultural idiosyncrasies. However, he could still confidently answer the clients' varied and wide ranging questions, and bring the significant issues to their attention by understanding what they needed to know. This display of expertise could not be explained with a computational and calculative approach to practice where practitioners stand outside the situations that they are involved in. It requires the acknowledgement of expertise-in-context and the skills of context-appreciation and task-flexing as a result need to be part of the education of practitioners. This gives greater emphasis to case studies, problem based learning, action learning and simulation in an academic environment. This work suggests that the way these learning approaches handle contexts and expect handling of contexts by students is critical. However, in order to evaluate these approaches and refine them, we need a much more solid model of practitioner development which works with the difference in knowledge between academia and practice contexts.

Conclusion

What we are gathering in this project are ideas about the philosophical nature of practice particularly around expertise. Practice is intimately attached to the whole social, political, economic and technical world and so it displays the fundamental questions of it. The fact that practitioners do not need to see or explain this is indeed part of the issue. We, as academics, need to actively value the richness and complexity of their skills. We must not present an idealised view of the operation of the industry as merely the performance of rules.

The presentation of the narratives from practice in this way demonstrates the success of Dreyfus's 5 stage model. This is significant for the what and the how of the education of novices and, at Master's level, competent practitioners. Construction education still resides substantively in a technical world where knowledge is separated from the situations of practice and tested in absolute terms. Professional education must move away from a pure knowledge-transfer model to a knowledge-in-practice model for the novice to become an independent learner with critical solution composition skills, where the handling of incompleteness through appreciation of context, is acknowledged (Boyd 2006). This will include appreciating situated experience (Lave and Wenger 1991) where

actions are negotiated from: norms of knowledge, social and organisational positions including status, power and authority, perceptions of risk including loss of face as well as technical unknowns, and personal friendships.

The research is developing more robust understandings, and approaches, to expertise development. The partnership between investigators and companies is crucial for bridging across disciplines and from academia to practice. It is within this environment that a view can be created of what is better practice and better education.

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