

Site walks as a learning practice for professional engineers

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BACKGROUND

It is well recognised that changes in the contemporary world demand that professionals continuously learn. Often this continual professional learning takes the shape of formal courses, seminars and other obviously educational events. The starting point of this paper is an acknowledgement that people also learn in the day-to-day practices that constitute their work.

Work can be understood as a bundle of practices that are typically shared by most people employed in that profession. For engineers, and experienced engineers in particular, an example might be attending design review meetings, toolbox talks and or carrying out site walks. In this paper we posit that these practices afford important opportunities for professional learning.

PURPOSE

Drawing from contemporary practice theorists such as Schatzki et al. (2001), Gherardi (2008, 2009), and Gherardi and Nicolini (2003), this theoretically motivated, qualitative paper begins by conceptualising the notion of 'practice'. Our conceptualisation includes a discussion of some common characteristics of practices that, we will argue, afford learning opportunities. Following this, we provide a rich and detailed account of one such practice in order to elucidate the professional learning enmeshed in the day-to-day work of experienced engineers. The practice used for this is the 'site walk'.

DESIGN/METHOD

Our methodology was both iterative and generative and comprised several phases of data collection. In the first phase we analysed a range of documents, held focus groups with experienced engineers and followed up with semi-structured interviews with focus group participants. In the second phase, and the one reported in this paper, we sought elaboration on the identified practices through unstructured observations and a further focus group. These methods yielded qualitative data that was subjected to thematic analysis and conceptualizations through a practice theory lens.

RESULTS

A common feature of site walks is that they are strongly linked to the productive work of engineers and almost always involve purposeful communication with a variety of others. Moreover, these others represent a range of roles within the project (e.g., clients, sub-contractors, designers, site managers). Each brings to the instance of the collective practice particular expertise and knowledge. The practice's success is reliant on the professional diversity of group members, and the co-production of knowledge is possible because of each member's unique contribution. The results confirm our thesis that practices, such as the site walk, afford rich opportunities for professional learning.

CONCLUSIONS

A practice lens provides a new and different way to understand professional learning. For example, it shifts a normalising focus from evaluating learning through attendance at seminars, workshops and the like to the everyday work activities of engineers. Understanding everyday engineering work as learning practices has implications for how professional development is recognised, acknowledged and even rewarded. These implications are yet to be explored.

KEYWORDS

Practice theory, qualitative research, professional learning

Introduction

In this paper we posit that work practices present important opportunities for the professional learning of experienced engineers. We present our theoretically motivated paper in three parts. The first part provides background to the issue of professional learning and argues for a departure from traditional understandings of professional learning. Drawing on contemporary practice theorists such as Schatzki, Knorr Cetina and von Savigny (2001), Gherardi (2008, 2009), Gherardi and Nicolini (2003), and Hager, Lee and Reich (2012a), the second part conceptualises the notion of 'practice'. Our conceptualisation includes a discussion of some common characteristics of practices that, we will argue, afford learning opportunities. After commenting on our research process, in the third part we provide an empirical account of one such practice, the site-walk, in order to elucidate the professional learning enmeshed in the day-to-day work of experienced engineers and illustrate the potential of viewing professional learning through a practice lens.

Background

The demand for employees to learn continuously is well recognised. There is an expectation by organisations that employees engage in ongoing learning in order that they meet the demands of continuing change. This is true of most employees, especially professional engineers. Many large engineering firms (like our research partner's) provide comprehensive graduate programs specifically to support new engineers' entry into the profession. These programs recognise the importance of providing new graduates with a broad range of learning experiences including structured activities and exposure to various facets of engineering work. The programs are relatively well documented, scrutinized and evaluated by employers, researchers and professional associations (e.g. Engineers Australia, 2009). However, for experienced engineers the situation is often less comprehensive or explicit, even when the demand for continuing professional learning remains. Experienced engineers, while still required to meet demands of ongoing change, do not attract the same organisational emphasis as their less-experienced counterparts. Rather, their professional learning more often takes the shape of attendance in formal courses, seminars, conferences or other identified educational activities. These might be provided in-house, or by professional bodies, or by other interested parties.

While these educational activities serve an important purpose and indeed provide 'development', they do not account for the full gamut of professional learning. Further, accounts of professional learning that focus solely on participation by individual engineers in structured learning activities limit the potential for making the most of professional learning opportunities within organisations, particularly when considering everyday work. Over the past decade researchers interested in workplace learning have drawn attention to how much workplace learning happens as part of actual work itself (e.g. Hager, 2011). These researchers show how workplace learning is embedded in the work context, which, far from being a backdrop or mere stage where action occurs, is actually implicated in workplace learning. Work can provide affordances for learning (Billet, 2001) or, indeed, inhibit learning (Scheeres et al., 2010).

These new understandings of workplace learning challenge the ways in which professional learning is understood and evaluated—particularly when the default (and perhaps easiest) option is to accrue attendance time doing formalised activities. This is often the case for engineering firms, engineers themselves and professional associations. For firms, the acknowledgement of professional learning generally requires engineers to participate in performance management systems where they report on the achievement of previous goals and outline development goals for the forthcoming year. Typically, the number and type of systemised educational activities participated in are privileged over nuanced accounts of learning during work. Similarly, professional learning is largely reduced to individual

engineers' attendance in courses and seminars, when reporting development to professional associations. Engineers report to professional accrediting bodies against pre-determined competencies in an effort to demonstrate ongoing development and this can have consequences for continued registration and, in some cases, the right to practise their profession. For some Australian professionals, it is possible to achieve the required professional development through course attendance alone. In all, the professional learning of experienced engineers is inhibited by reductionist evaluations that typically conflate professional learning with structured educational activities.

Writers on workplace learning (e.g. Boud & Hager, 2012; Hager & Hodkinson, 2009; Fenwick, 2009) argue that many of the current assumptions about professional learning are problematic, creating an atomised and conservative professional subject. They suggest alternatives for theorising and assessing the nature of professional learning that shift the focus from the learning subject to practice. They use expressions such as *learning as participation*, *learning as construction* and *learning as becoming*. Here *learning as participation* focuses on learning as a daily social practice, intertwined with work practices, and not one that is limited to transference of content by experts in training rooms. It emphasises the social nature of learning at work rather than assumptions about individual acquisition and transference. The *learning as construction* metaphor draws attention to the messiness of professional practice. Rather than unproblematic skills and knowledges being 'transferred' from one site to another, the notion of construction appreciates that the application of knowledge and skills constitutes a new instance that is dependent on the context in which it is realised. Thus rather than skills and knowledge being 'transferred', they are continuously constructed (and reconstructed) in daily practice. Finally, *learning as becoming* better recognises the continuous nature of professional development.

To summarise, engineering employers and professional engineers themselves have tended to place less emphasis on informal workplace learning when evaluating and accrediting professional learning. While organisations and professional bodies are rightly concerned with professional learning, the tendency has been to conflate professional learning with attendance through structured activities and events. Contemporary descriptions of professional learning as 'acquisition' and 'transference' serve to limit its understandings (Boud & Hager, 2012). What is needed is a new approach to professional learning of experienced engineers that reflects the social, material and situated nature of their learning.

In response to this need, this paper turns to the burgeoning work that employs practice theory to understanding professional learning (e.g. Hager, Lee & Reich, 2012a). A practice theory perspective provides a different lens with which to view work and workplace learning and promises new understandings of professional learning for organisations, professional bodies, and for experienced engineers themselves. It shifts a normalising focus from attendance at seminars, lectures and workshops to the everyday work activities of engineers.

Some features of practice

Work as a 'bundle of practices and material arrangements'

A practice theory understanding of work suggests that work, including engineering work, is purposeful and consists of "bundles of practices and material arrangements" (Schatzki, 2006, p. 1867). These include the rules of the organisation and professions, the shared practical understandings (how to carry out the basic doings and sayings) and the general understandings that are shared among those who carry out that profession (Schatzki, 2012).

This may be illustrated with an example from teaching. The bundles of practices that make up a teacher's work might consist of delivering lectures, developing tutorial plans and marking assignments. All teachers would recognise these practices, and even though there will be differences in how they are carried out, there remains enough similarity to make them recognisably germane to the profession. Along with these specifically 'teacher' practices,

teachers' work would also include other practices like participating in meetings and undertaking performance reviews. While these later practices are common in many professionals' work, they would take on a particular form, for example, a faculty meeting.

Likewise, for engineers—and experienced engineers in particular—meetings and performance reviews take on specific forms that make them meaningful to the field of engineering practice. So, rather than a faculty meeting, a 'design review meeting' would be more likely for experienced civil engineers. Along with meetings, the bundles of practices and material arrangements that constitute experienced construction engineers' work might also include, for example, toolbox talks and site walks (Rooney et al, 2012). These would be recognisable across the engineering field, even if idiosyncratic to a particular organisational culture or to an individual engineer's, or a sub-group's, preferred way of practising them.

Other features of practice

Along with Schatzki, there are other theorists interested in practice approach. While they may disagree on some features of practice, five partly overlapping elements of practice are typically seen across various bodies of practice related studies (Hager et al., 2012b). First, practices are *embodied*. Kemmis (2009, p. 23) argues that practice is "always embodied (and situated)" encapsulating "what particular people do, in a particular place and time, and it contributes to the formulation of their identities as people of a particular kind, and their agency and sense of agency". Second, practices are *materially mediated*. When practice is undertaken, it occurs in conjunction with material arrangements in the physical world. These may include objects such as raw materials, resources, artefacts and tools, physical connections, communication tools, and material circumstances (Kemmis, 2009; Schatzki, 2005). Third, practices are *relational*. People, artefacts, social groups and networks develop characteristics in relation to other subjects, social groups or networks such that they are formed and structured socially (Kemmis, 2009). Fourth, practices are *situated*. They are situated in particular settings, "in time, in language and in the dynamics of interactions" (Gherardi, 2008, p. 521). Fifth, practices are always *emergent*. That is, they evolve over time and over contexts: they change in the light of circumstances.

Practices are therefore more than simple activities or actions undertaken by workers. Rather, practices are enacted; workers engage in "doings and sayings" (Schatzki, 2002, p. 81) that bring together combinations of know-how, rules, purposes, personal investments and general understandings relevant to their job (Price et al., 2012). In researching practices, a focus on this nexus of doings, sayings and relatings focuses the researcher on ways of uncovering the practices of a professional group.

Making use of the practice lens

With the aforementioned conceptualisations in mind, we suggest that professional engineers' work when viewed through a practice lens can elucidate new understandings of professional learning. In the remaining part of this paper, we first comment on our research process and then make use of a practice lens to investigate 'site walks' as a potential learning practice of experienced engineers. In the service of clarity we use the term 'site walk', acknowledging in the process that various labels (e.g. site inspection, pit tour, onsite audit and site tour) may be used here.

Methodology

The methodology adopted here for the uncovering of practices was both iterative and generative and comprised two phases of data collection. The first phase was an *identification* phase where we analysed a range of documents from the organisation, held three focus groups in two Australian capital cities with around eight experienced engineers (more than three years since graduation) in each group, and followed up with semi-structured interviews with four of the focus group participants. In both the interviews and the focus groups,

participants were asked to talk about, and provide detailed examples of, their day-to-day work. These methods enabled us to elicit 'rich descriptions' (Denzin and Lincoln, 2000) of professional engineers' practices. The transcripts of the focus groups and interviews were subject to thematic analysis, with the following themes identified:

- Communication—talking to others/gathering information
- Planning
- Dealing with challenges
- Risk management/avoidance
- Record keeping—diaries, meeting notes etc.

While this process helped us to know our data, a simple listing of themes was insufficient for identifying practices. We then examined the contexts in which these professional engineers did their communicating, planning, dealing with challenges etc., and through this process identified several practices, among them design review meetings and site walks.

In the second phase, and the one reported on here, we sought *elaboration* on the identified practices through unstructured observations (Basil, 2010) on a construction site as well as through another focus group of experienced engineers who were specifically asked for descriptions of the previously identified practices. These methods yielded qualitative data that was examined through a practice theory lens, with the results highlighting key aspects of practices already mentioned: embodied; materially mediated; relational, situated and emergent.

The Site Walk as a practice

As a practice, a site walk is constituted by the activities and events in particular sites and time, and by the doings, sayings and relatings of those who undertake them. There are some associated activities with regard to site walks. The first is movement: as the name 'site walk' suggests, walking is one way movement occurs. However, sometimes, based on the size of the project, this practice might be even better described as a site drive or site flight because the movement involves travel over larger distances. Site walks, by nature, are never static.

A further associated 'doing' is observing, seeing or looking. Engineers spoke about how they observed physical features of the site in order to locate features not represented in drawings. They observed how things were being done, possibly making suggestions about how to better follow processes and/or standards, and they observed whether all prescribed intermediate steps were undertaken or completed according to the design drawings and specifications. This type of 'doing' is mediated by a disciplinary understanding of standards, engineering principles, clients' input, and so on.

Undertaking a site walk was found to have the key elements of practices. It is an *embodied* practice. It is the whole person who engages in practice, not just intellect and skills. Moreover, as Kemmis (2009, p.23) points out, it contributes to the ongoing formation of the professional identities of those who undertake them. Site walks and professional engineers are therefore mutually constituted.

A site walk is a *practice that is materially mediated and with a purpose*; or more correctly, it may have multiple purposes. Some engineers noted how through the site walk they would find out what was going on, check the progress of various facets of the job, and ensure the job is compliant to a myriad of standards. Another important purpose for the site walk is to identify potential problems or hazards and/or identify problems that have already occurred, and then to find solutions to or mitigate further problems. One participating engineer, Steven, told us:

“So when we go out to look for our site walk, or any of these things, so these are things we're going to look for: whether the job is done safely, are we providing the quality required, are we doing the right thing, are we interpreting the drawings in the correct way at the site.”

Sometimes engineers attend site inspections at other similar sites with the explicit purpose of informing the primary project the engineers are working on. As Scott told us:

“...if you've got a contact, get over there and have a look what they've done. So get out and spend an hour with a planning team from another site. Companies are pretty good with reciprocal visits and stuff.”

The site walk practice brings together *human and non-human actors* (Gherardi, 2009). For instance, interviewees told us that along with other engineers (e.g. a site engineer) the following might also accompany them on a site walk: the foreman, service managers, the guy with the shovel, digger or leading hand, a blast crew, project manager, production superintendent, senior supervisor, various consultants, an environmental team or scientists, construction manager, client etc.

“It all depends, you might be going with a *junior engineer*, or I might be going out with the *construction manager*.” (Drew)

The actors shape the site walk; one site engineer told us how he “shakes in his boots” while he waits for the construction manager. In any case, a site walk's participants are related to its purpose. For example, experienced and novice engineers might carry out a site walk together with pedagogical intent. An interesting purpose we identified at one focus group was how the site walk could provide senior engineers with opportunities to mentor younger engineers or, as one told us, give them “a bit of a nudge in the right direction”. At the same time, the emphasis in these informal mentoring situations is to help newly graduated engineers learn how to figure things out for themselves. The impetus for this was an understanding that no two jobs will be identical and so engineers need a capacity to ask the right questions rather than know the right answers.

Along with human actors are the *non-human things* that shape a site walk. First there are tangible things that accompanied engineers on the site walk such as motor vehicles, cameras, mobile phones, blackberries, diaries, and pens. These non-human things enable associated activities (driving, taking pictures, looking up something on the internet, writing etc.). In one focus group, an engineer spoke about how he used a whiteboard pen to draw on the windscreen of the vehicle in order that “everyone was focusing on the same spot”. Within this example the windscreen and the pen are very much implicated in the site walk practice—not just as background objects but as ‘non-human actors’ that shape the site walk itself.

Then there are the less palpable things like standards, engineering histories, ideologies, cultures, wider socio-political arrangements, organisational policies and procedures.. All of these, while less obvious than the accompanying material arrangements, work to constitute the practice in very particular ways. For instance, compliance standards influence the gaze of site walk participants and therefore the decisions they make and the future actions they undertake.

While the practice we call site walks appear as a discrete action, the site walk itself is one of many activities that coalesce to constitute the work of professional engineers. For instance, something noticed/said/discovered on a site walk might then be taken to a design review, or constitute the topic of discussion at a toolbox talk. The site walk is not independent of the overall work that constitutes engineering work. Rather, it supports and informs other practices. In other words, a site walk is a practice that is both situated and relational.

The site walk is related to networking and the building of reciprocal relationships that many engineers told us are essential to their work. Barry, for example, said:

“That's where you really build the relationships with the guys in the field, from the guy with the shovel, to the guy on the digger, to leading hands, to the foreman.”

Barry's comment highlights how construction projects involve many people working co-operatively. Moreover, since engineers don't physically construct anything, the quality of the finished project will be influenced by the strength of their relationships with the people who do the work.

Site walk as a practice and learning

Just as each instantiation of the site walk is shaped by previous site walks, so too is each engineer's knowledge. Designing, for example, is an ongoing activity for most large engineering jobs, yet a final design is rarely available from the onset. The site walk provides opportunities for construction and design engineers to develop the design along with the clients and, in some cases, the users or their proxies.. Site walkers co-produce understandings of the work with each observation.

Practices are thus not static but *emergent*: they have a history within a profession but they change over time. For example, a decade ago, an engineer on a site walk would not have paid as much attention to safety and risk management. Older engineers we spoke to talked about a time when engineers actually factored in a number of deaths over the duration of a job. Today public opinion and rigorous OH&S regulations would not allow such views. Safety, now commonplace if not central to engineers' work, has reshaped how site walks are undertaken. As Steven, one of the senior engineers in a focus group, commented:

“It's changed dramatically in 10 years. It's gone from being something that people talked about to something that is the most important thing that you do.”

It is here that we can link practices to learning. Steven's comment attests to how safety has been 'learned' by professionals and become integrated into their day-to-day practices (site walks included). Moreover, each time he undertakes a site walk his knowing about safety is newly situated and mediated by the material arrangements specific to the site. Thus, rather than thinking of the site walk as an event where his knowing is 'applied', it is more the case that his knowing is enacted in a uniquely situated manner (Gherardi 2009).

In addition to safety becoming mainstream for most of the engineers we spoke to, there is an emergent focus on how the environment is reshaping engineering work. An increased awareness of environmental concerns has seen the advent of environmental scientists co-producing projects along with engineers and others. During an on-site explanation of earthwork activities, Drew told us he has “... started to think a little bit more like ... [an environmental scientist]”. This increased awareness can be understood as learning.

Learning occurs here as an integral part of the practice of site walks. Engineers do not learn from site walks as they would learn from a structured course, but through engagement in a practice that is necessarily constituted as both work and learning. Learning is both enhanced and limited by the variety of challenges that site walks confront participants with. We can see how engineers might extend the scope of their learning through participating in site walks that involve making more complex decisions with a wider range of informed participants.

Conclusion

This paper draws on the work of contemporary practice theorists to suggest that everyday work practices present important opportunities for the professional learning of experienced engineers. By conceptualising the notion of 'practice', it argues for a departure from traditional understandings of professional learning. By providing an empirical account of one engineering practice—the site walk—it elucidates the professional learning enmeshed in the day-to-day work of experienced engineers.

A common feature of site walks is that they are strongly linked to the productive work of the engineers and almost always involve purposeful communication with a variety of others. Moreover, these others represent a range of roles within the project (e.g., clients, sub-contractors, designers, site managers, etc.). Each member brings to the instance of the collective practice particular expertise and knowledge. The practice's success is reliant on the professional diversity of group members, and the co-production of knowledge is possible because of each member's unique contribution. The results from our data collection confirm our thesis that practices, such as the site walk, afford rich opportunities for professional learning.

Understanding professional learning as enmeshed in the everyday work of professionals, intertwined with material arrangements and in relationships with others has potential implications for organisations eager to foster professional learning. What these implications are is beyond the scope of our current research, they will be central to a forthcoming study.

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