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Rethinking Situated Learning: Participation and Communities of Practice in the UK Fire and Rescue Service

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Abstract

Legitimate peripheral participation is the bedrock of situated learning. It involves the novice or newcomer acquiring skills through work in a community of practice (CoP). It is generally assumed that CoP learning involves novices moving in a centripetal manner from periphery to core, gaining skills and knowledge from established workers before becoming full members of the community. This article draws on qualitative research in Northern Fire, one of the UK's largest fire and rescue services, to challenge the idea that novices' learning progression is linear and sequential, highlighting their fundamental importance in CoPs. It argues that learning is radial, with established workers learning from novices, just as novices learn from established workers. The novices contributed to group dynamics passively, simply by being there; and actively, through their own skills and theoretical knowledge. When funding cuts and austerity curtailed recruitment, the absence of novice firefighters hindered CoP learning.

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Introduction

Situated learning occupies a central space in the community of practice (CoP) literature. Lave and Wenger's (1991: 32) study of midwives, tailors, butchers and non-drinking alcoholics demonstrates how learning and the acquisition of knowledge are sociocultural practices built upon the concept of legitimate peripheral participation (LPP), with members gaining skills by working and progressing from basic tasks to full participation. So novices move in a linear and sequential manner as they inculcate themselves in the practice of more experienced 'old-timers'. LPP acts as a bridge to acquire skills, experience and approbation from peers, and learning occurs via 'centripetal participation in the learning curriculum of the ambient community' (Lave and Wenger, 1991: 100).

The way that organizations and work teams are structured has a significant impact on working and learning (Felstead, 1993; Felstead and Ashton, 2000; Felstead et al., 2009; Grugulis and Vincent, 2005; Marchington et al., 2005). Work and job design can encourage learning, through task discretion, access to other workers or external experts, and by encouraging professional responsibility, all of which facilitate employee contributions. Alternatively, it can restrict learning through scripts, routines and narrow job boundaries so discretion is limited and contact with others restricted (Felstead et al., 2007; Fuller and Unwin, 2004a; Grugulis, 2007; Lloyd and Payne, 2017). Studies reviewing the links between structure and skills tend to focus on experienced workers. These have considered the widespread corporate redundancies which stripped organizations of their most experienced staff (Tyler and Wilkinson, 2007); the impact of removing middle-ranking managers (Littler and Innes, 2003, 2004); and limiting novices' access to more experienced workers (Grugulis and Stoyanova, 2011; Lave and Wenger, 1991). However, while there is consensus on the damaging effects of removing experienced workers, little has been written on the impact of taking out novices. The assumption seems to be that the loss of inexperienced workers is a minor inconvenience, with few consequences for the wider group.

This article argues that CoPs are complete communities that are dependent on novices just as they are dependent on experienced members. Novices are peripheral members of the group in the sense that they have yet to learn the skills required of fully functioning members, but they play an important role in the way that their group functions and are key to its efficacy. 'CoPs consist of and depend upon a membership' (Lave and Wenger, 1991: 55) and novices change the dynamics of CoPs in two ways: firstly, by simply being there. Novices need to gain skills, so established members of the community are required to demonstrate, model or teach those skills, explicitly articulating taken-for-granted assumptions, remembering important incidents to recount and developing their own praxis through dialogue. So, when novices are present, they constitute an incentive for established members to focus on both the novices' learning and their own. Secondly, while novices may be inexperienced in the work of the CoP, they are not devoid of knowledge, skills or viewpoints and their perspectives actively contribute to work practice (Fuller and Unwin, 2004b). Participation in CoP groups is often messy, problematic and inchoate. Instead of a seamless progression from periphery to core, the learning trajectory of novices is radial and non-linear and learning itself is a two-way bilateral process: novices learn from more experienced staff, as would be expected, but novices also

serve to consolidate and reaffirm old-timers' knowledge. So, learning through participation is multi-directional and more complex than previously assumed. Such a finding fits far better with the informal dynamics of a CoP than the idea that learning flows hierarchically, only in one direction and only for the duration of the novitiate.

The UK Fire and Rescue Service is a key profession in which to explore learning dynamics since the praxis of firefighting is characterized by learning through participation. Firefighters operate in watches comprising between four and 10 individuals. Watches form close bonds of affection, mutual trust and loyalty because they work, sleep and train together (see Pratt et al., 2018 on trust in the US Fire Service). It is these small, stable watches which served as CoPs. However, it is also an area in which recruitment both generally, and of novices in particular, has been limited. Nationally, the number of serving firefighters declined from 51,806 in 2008 to 42,300 full time equivalent (FTE) in 2018 (Home Office, 2019). For Northern Fire, a combination of austerity and budget cuts resulted in a freeze on recruitment, which lasted from 2009 until 2017. During this period, none of Northern Fire's stations employed any novices. This affected the ways in which firefighters' CoPs functioned and it was this environment of austerity and frozen novice recruitment that prompted a reappraisal of the theory and practice of situated learning.

This article contributes to the literature in three ways: (i) by developing the theories on learning in CoPs to include the contribution that novices make, as well as the radial and inchoate ways that knowledge and skills are shared; (ii) by setting out a framework for the way that novices contribute both passively – by being present, listening to CoP stories and stimulating development, and actively – through their skills, knowledge and participation, which strengthens understanding of the ways that CoPs operate and the elements that distinguish them from classroom-based learning; and (iii) the article provides rich empirical detail about work in the Fire and Rescue Service.

The article starts by reviewing the notion of legitimate peripheral participation and the dynamics of learning within communities of practice, particularly learning through storytelling. This is followed by a discussion of the methods employed in the research. The empirical section shows how novices contributed, both passively and actively. The article concludes by drawing out the practical and theoretical implications for learning through participation.

Communities of practice

In the literature on CoPs, knowledge is context dependent and *situated*, with group members learning from one another by performing tasks (Brown and Duguid, 1991; Lave and Wenger, 1991; Suchman, 1987; Wenger, 2005). Members construct meaning and identity via participation, sharing everyday work praxis and reification, giving form and substance to experience (Nicolini, 2007; Strati, 2007; Wenger, 2005). Novices learn by participating in groups: observing existing practice, supporting experienced workers, taking on basic tasks and gradually assuming responsibility for work. Through this process of LPP, novices participate in work-based activity under the guidance of a 'master'. Slowly and sequentially, the novice moves from the periphery to the core of the CoP, with

membership becoming more secure as their competence increases. At the heart of this process is the novice's journey: 'becoming a full participant in a sociocultural practice' (Lave and Wenger, 1991: 29). Lave and Wenger posit that LPP starts with situated learning, which is a 'transitory concept' or a 'bridge' towards full participation in work-based practice (p. 24). They note how newcomers generate both identity and motivation as they move towards full participation in a centripetal manner. LPP is not contingent upon a didactic process of learning or acquiring knowledge. Rather, learning is situated within a CoP and is diachronic, occurring naturally through work. Brown and Duguid (1991: 48) observe that LPP 'escapes the problems that arise through examinations of learning from pedagogy's viewpoint'. It is an integral part of membership and takes place through work. This context is key with 'the conditions of learning, rather than just abstract subject matter, central to understanding what is learned'.

Much of the literature focuses on the ways that LPP allows novices to participate in working practice, and thus act in a productive capacity while gaining skills. It is easy to see why novices should be of interest since they have most to learn and tracking their footsteps allows the reader to understand the CoP. So, in Eraut's (2007) longitudinal study, trainee accountants, engineers and newly qualified nurses gained skills and professional approval while Bettiol and Sedita (2011) show how skilled novices in the creative sector attempted to build professional communities in Turin.

This focus on working as learning is not simply a different technique for conveying knowledge and skills within a work group. It stems from the nature of work itself, which is 'different to what management says it is' (Orr, 2006: 1805). In Orr's (1996) account, the photocopier technicians would turn to their peers for help, rather than to the photocopier manuals, because the manuals were of little assistance with tricky problems. The manual set out one way of solving a problem, but not what to do if this failed to work, nor why this set route forward was appropriate. To understand why the machines responded in particular ways and to solve complex breakdowns effectively, the photocopier technicians engaged in storytelling. This was not a break from work, but an essential part of it (Bechky, 2006). It was through narrative and stories that the technicians made sense of their machines, that they identified the causes of problems and that they assisted their colleagues (Orr, 2006: 1812):

> One can, I think, suggest that storytelling is quaint only if one does not know how it is part of the work, if one does not know how the work is done. Not knowing how work is done leads to the sense that work is completely malleable and can be exactly, and only, what management says it is.

Storytelling was the way technicians developed, made sense of, and passed on their practices (Brown and Duguid, 1991). As Bechky (2006: 1758) observes:

> Stories both describe and constitute the work. [...] Stories assume the listener is a competent community member; in telling, technicians focus on the perplexing details that will draw other technicians into the discussion. Stories help technicians think clearly, spell out differences in problems, and support the development of diagnostic understanding; they also instruct and/or challenge other technicians, assert membership, and celebrate the heroism of the community.

The literature makes clear how important narrative, storytelling and discussion are in learning (Ron et al., 2006; Scarbrough et al., 2004). Lave and Wenger (1991: 34) note how 'stories can be so powerful in conveying ideas'. Similarly, both Sfard (1998) and Kaminsky (1999) stress the importance of using metaphors in learning, together with other more formal modes of acquiring knowledge. Abma's (2003) empirical analysis of palliative care in the Netherlands explored the use of storytelling workshops as a means of augmenting organizational learning interventions. The adoption of a relational and dialogical approach to narrative is a key component of 'learning by telling' (Bodenrieder, 1998; Cook and Yanow, 1996; Greene, 2001; Guba and Lincoln, 1989). Stories facilitate discussion, which can also produce a counter-narrative that sometimes challenges more orthodox organizational assumptions and beliefs (Abma, 2003; Schwandt, 1999; Sims, 1999; Wadsworth, 2001). With complex work, rules are insufficient (Duguid, 2006) and narrative is key (Yanow, 2006). Nor were stories restricted to the narrator's personal reminiscences. Pratt et al. (2018) observe US firefighters retelling stories they had been told by others to pass on lessons and reinforce key points. Such activities strengthen the group's ties to one another since the nature of storytelling is communal, so knowledge gained through it is shared and collective (Brown and Duguid, 1991; Lave and Wenger, 1991; Wenger, 2005).

Communities are composed of novices, journeymen and experts. Interaction within them is frequent and informal, with members generally co-located. Where interaction is absent, novices may struggle to gain skills (Grugulis and Stoyanova, 2011; Lave and Wenger, 1991). Yet, despite this constant, informal contact, despite the storytelling and the shared values, and despite the use of the word 'community' to label the group, the literature's assumptions about knowledge transfer are hierarchical; that knowledge and skills flow in one direction from expert to novice. Such a theory might fit well with classroom-based, didactic teaching; it sits less easily with the idea of a small community group, working and learning together. Non-drinking alcoholics, one of Lave and Wenger's (1991) original CoPs, are deliberately non-hierarchical (Alcoholics Anonymous, 2001). Group members attend to gain or maintain sobriety but their emphasis is on learning for all members, not teaching conducted by an elite. Unsurprisingly, empirical accounts of CoPs suggest that novices' learning trajectories can often be more problematic and nuanced than Lave and Wenger originally anticipated (Fuller and Unwin, 2004b; Jewson, 2007). Fuller and Unwin's (2004b: 32) analysis of apprenticeships in steel companies challenges the idea that 'expertise is equated solely with status and experience' in the workplace and observes the way that apprentices taught, as well as learned (see also Fuller, 2007).

The literature provides detailed, rigorous and vivid accounts of CoP practice in a range of settings, but because its focus is on the ways that novices learn it neglects the contributions that they make to the groups that they join. Fuller and Unwin's (2004b) work reveals novices' contributions to teaching as well as learning and sets these against the way each workplace 'expanded' or 'restricted' their opportunities through job design, access to external contacts and power relations (for a more detailed discussion of power relations in CoPs see Contu and Willmott, 2000; Roberts, 2006). This article draws on that insight and extends it, putting forward a new understanding of the ways that novices

spur and contribute to learning and knowledge sharing in the entire CoP. It now details the methods through which these findings were developed.

Research methods

The methodology employed in the research was a single case study of Northern Fire. Fieldwork took a variety of formats with focus groups, interviews, a diary study, access to formal procedures, training and operation manuals, individual training and development records, and ethnographic participation in the watches and the region's senior management team combining to provide insights from a range of perspectives. Fifteen focus groups were conducted with 62 firefighters; 15 semi-structured interviews covered operational staff and the senior management team; and ethnographic observations of Red Watch and the senior management team were conducted for a total period of seven months. Inspiration was drawn from Orr's (1996) ethnography of the trials and tribulations of photocopier repair personnel, and, following Cunliffe (2008), the design sought to occupy a 'room with a view' to paint a vivid description of front-line firefighters and senior management. Data collection for phase one commenced on 1 November 2015 and concluded on 23 May 2016.

This first phase of data collection was conducted at a time in which there were no novices employed in any of Northern Fire's stations. The research had not originally intended to consider novices specifically. Rather, it focused on learning and knowledge transfer in the Fire and Rescue Service. It was the informants themselves who raised the issue of novices, repeatedly and unprompted. One of the advantages of qualitative research is its ability to adapt (Van Maanen, 1988; Watson, 1994); this was clearly an area of interest and importance to the firefighters so we examined it in more detail. Iterations between fieldwork and the literature revealed a gap. The literature on human resource management (HRM) in times of recession reveals the ways in which employment practices change (Cook et al., 2016; Cunningham, 2016; Lewis et al., 2017; Van Wanrooy et al., 2013) but does little to draw out the impact on learning and skills development (for an exception, see Felstead et al., 2012) and no studies focus on the implications of a dearth of novices for CoPs. This research helps to remedy that omission.

It also gave rise to concerns. While the study as a whole combined direct observation with interviews, focus groups and documentary analysis, when considering novices it was reliant on informants' accounts of past practice. It is possible that novices were particularly highly regarded because of their absence; that CoPs in which novices were more common would have been less appreciative, or less acutely aware of the contribution they made to the group. Accordingly, a second stage of data collection was set up from 1 August 2019 to 1 October 2019 to gather data from firefighters while they were working with novices and to explore the views of the probationers themselves. During this phase of data collection four probationers were interviewed and three focus groups consisting of probationers and their mentors were conducted, along with observations in fire stations and two semi-structured interviews with senior management. This return to the field also provided the opportunity to re-interview some of the informants from phase one, and second interviews were conducted with three experienced firefighters and the chief training officer.

Rich, detailed, qualitative data were obtained from observing firefighters and senior management during their everyday professional praxis. Interviews and focus groups were used to explore firefighters' experiences of knowledge transfer within CoPs throughout the course of their careers: when they were novices, their experiences of interacting with novices, and their experiences of participating in CoPs without novices. Focus groups were conducted with 12 individual watches, covering Northern Fire's entire geographical area. The 62 participants interviewed comprised 48 front-line firefighters, 10 station managers and four group managers. The focus groups were conducted in a broad and diverse range of fire stations to reflect Northern Fire's varied topography. These ranged from large busy stations based in the city centre to smaller, more rural and remote stations, with vastly different rates of fire and call-outs. In addition, 15 semi-structured interviews were conducted with senior management and key support staff. The top management team were all interviewed, as were managers within centralized specialist teams.

An ethnographic method was used to explore and understand the lived experiences of both front-line firefighters and senior management. Participant observation during the research comprised of two elements. Firstly, Red Watch were observed over the period 1 February 2016 to 23 May 2016. This covered the time that Red Watch prepared for formal assessment on their breathing apparatus praxis and techniques, culminating with an on-site assessment day. The first author participated in and observed Red Watch's breathing apparatus training as they undertook search and rescue exercises in complete darkness, tackled extinguishing car fires or negotiated access to burning buildings. The first author also participated in a 'live burn' simulated fire with Red Watch during their assessment day on the equipment. This was undertaken to experience first-hand how Red Watch as a CoP dealt with the challenges and pressures of formal breathing apparatus assessment. Secondly, ethnographic observation was undertaken shadowing the deputy chief fire officer during a handover period.

Ethnographic observations were set out in detailed field notes then uploaded to NVivo (version 11) and thematically analysed. All interviews were recorded, transcribed and also uploaded to NVivo. Triangulation of data was conducted through a detailed and systematic review of Northern Fire's formal knowledge management literature. This comprised electronic and hard copy training and operational manuals which covered practice concerning hazardous chemicals, casualty care, and search and rescue techniques. All 48 firefighters maintained their own training and development records held on electronic maintenance of competence files (EMOCs). These EMOCs were also reviewed as part of the data analysis process. This combination of participant observation, focus groups, interviews and documentary analysis provided a richly detailed empirical account of working and learning in the Fire Service from a range of different perspectives.

The case organization and context: Northern Fire and Rescue Service

Northern Fire is a fictional name given to a fire and rescue service based in the North of England. Northern Fire operated in a large and diverse geographical area comprising a

mix of open countryside and high-density cities, providing fire and rescue services over some 800 square miles with a total population in excess of two million. The service had, at the time of data collection, a total of 43 fire stations divided between five separate districts. Shortly before the fieldwork commenced, Northern Fire had been subject to industrial action, with many firefighters striking against proposed changes to both pension provisions and shift patterns. Industrial relations with senior management at some stations remained febrile during the fieldwork. Moreover, substantial budget cuts resulted in a freeze on the recruitment of new front-line firefighters, so Northern Fire had no probationary firefighters between 2009 and 2017, and all participants in the first and key stage of data collection were established firefighters. By the second phase of the fieldwork, Northern Fire had recruited 12 novice firefighters, so the research was able to cover work in both the presence and the absence of novices.

The UK Fire and Rescue Service has seen a significant decrease in the number of fires attended by firefighters. This is due to a combination of fire prevention and safety awareness initiatives, the increased use of non-flammable materials, a decline in the use of open fires, a reduction in the number of smokers and legal restrictions on smoking in public places. Consequently, firefighters are fighting fewer fires overall, and have fewer opportunities to gain experience of tackling serious fires. For the period 1999 to 2000, fire and rescue services in England attended 929,573 incidents while between 2015 and 2016, 528,691 incidents were recorded. An 'incident' is defined as either a fire, false alarm or non-fire-related incident. In the 15 years prior to this study, there had been a 57% reduction in the number of incidents attended by firefighters; a reduction reflected in all but one sub-area of the Northern Fire region. In 2010, there were 138 fires in Fire Station A's rural catchment area. By 2015 this had fallen to 58. The only exception to this decline was Fire Station B, which was situated in a city centre. In 2010, there were 127 incidents, increasing to 1067 in 2015, though many of these were less serious, mainly call-outs to false alarms. The area included many high-rise apartments, which automatically triggered a call-out when alarms were set off, resulting in an increased incident rate, but not in a higher number of actual fires. This overall decline in fires is clearly welcome in most respects, but considered only from the perspective of experiential learning, it restricted the opportunities firefighters had to practise and develop their skills in real-life situations.

As a result of this decline, both firefighters' daily experience of work and the way they learned their skills, altered; the craft of firefighting had changed substantively over the decade prior to the study. Firefighters increasingly spent time conducting safety visits to shopping centres and commercial office buildings. One experienced female firefighter described how her watch was much more involved in community events. They would organize tea dances for the elderly, conduct far more fire safety visits and liaise with local charities. As one of her colleagues observed:

> And, unfortunately, people probably 20 years into the job, sort of wanted to join a job to be a firefighter, ride a fire engine, squirt water and do what they consider to be a proper firefighter's job. Unfortunately, that's now 5% of a firefighter's day. (Firefighter 15, male, 9 years' experience)

Learning and training were still important parts of the job, but the emphasis was increasingly on simulated incidents and storytelling rather than learning from real-life situations.

Rethinking situated learning

Novices' passive contribution: Simply being there

It was into this environment that a freeze on recruitment was imposed. These changes were felt deeply in the various fire stations:

> [I]t is something that has been missing for about seven years; we haven't recruited. So not having that on station – 'cos you have a vested interest in bringing these guys up to standard – in making sure that they know and they can benefit from your experience, now that doesn't happen … so there's got to be a detriment to that. (Station Manager, male, 27 years' experience)

This view was widely held. Every single one of the 12 participating watches regretted the freeze on recruitment and corresponding lack of novices, with no dissenting voices. Novices served a function in the CoP simply by being there. The mere presence of novices changed praxis in a number of ways: the level of training for the whole watch increased; established firefighters were inspired to reinforce their own skills so that they could act as examples to their new colleagues; and all were prompted to revisit their stories of past practice. When novices were recruited, they were welcomed:

> When we got told we were gettin' probationer … I thought 'brilliant' – gets you back into it … lifts you up. (Firefighter 59, male, 13 years' experience)

Firefighting involved collaborative working, with all the members of a watch reliant on their colleagues' actions and competence, so all the members of a watch would cooperate in developing novices' skills and ensuring they could cope with live fires. This knowledge transfer required additional participation in training for everyone in the station. Basic core skills such as erecting ladders, reeling out hoses and effecting search and rescues were revisited. All firefighters were required to be certified as competent with their training and achievements recorded on EMOCs. Both this process and firefighting practice was new to the novices so watches were required to arrange for the appropriate training to ensure everyone reached and maintained an acceptable level of competence. As one mentor said in the presence of his novice:

> We need to have each other's backs out there [at a fire], so my life depends on him [points to the novice] knowing what he's doing. (Firefighter 61, male, 10 years' experience)

Watches were regularly called out during training drills. For experienced groups, the call-out would cut short the drill; those with novice members would complete the drill on their return. There was no formal guidance mandating this, but the experienced members of the watch felt a collective responsibility for ensuring that their probationer mastered the skills and passed their modules:

It's a bonus to the shift … basic core skills, drills, imparting our knowledge. A positive effect. We've had a 10-year recruitment hold, gives us a kick up the backside. (Firefighter 61, male, 10 years' experience)

Breathing apparatus (BA) training was particularly important. The Fire and Rescue Service only allowed firefighters who had passed their initial BA training course to use BA equipment. The operating policy stipulated continuous training and development, with firefighters being formally assessed on BA techniques on an annual basis. In addition, instructions for use and maintenance of BA equipment stipulated by Brigade Technical Bulletins had to be followed. Established members of the CoP needed to reinterpret and represent their own knowledge in a way that was meaningful and useful to new recruits as well as identifying gaps in the novice's existing knowledge and training needs. The watch manager of Fire Station G, where the majority of firefighters were aged 50 or over, explained that, when there had been new recruits, the opportunities for learning and sharing knowledge were abundant. He recalled 'bringing himself up to speed' and critically reflecting upon his own praxis:

I mean, for me, for me personally, what's been good on this station is that when people have retired or left for whatever reason, we have always tried to recruit. So, a few year ago, had this … young blood came in and it were like, to do the basic core skills, come back, got an NVQ to do and get them through it. So, for me personally, to sit down with somebody and find out what they have been taught and what they don't know, and then you can build. (Watch Manager/Firefighter 20, male, 14 years' experience)

He was not the only informant to take steps to ensure that their own skills were up to scratch; all 12 station managers reported putting in additional efforts; they would refresh their knowledge of the core competencies, the technical aspects of dealing with hazardous materials, or casualty care, to avoid appearing as though they had gaps in their own expertise. Probationers' mentors were particularly enthusiastic about the way that novices had rejuvenated the culture around training, giving it new purpose. Firefighters would practise erecting ladders in confined spaces, extinguishing simulated fires and cutting dummies out of the wreckage of crushed cars. The knowledge that their skills would be on public display focused their attention on their own practice, which also provided an impetus to strengthen and reinforce this practice. Most firefighters relished this challenge:

I better know that because I'm going to look a bit daft if he knows something and you do make more of an effort going out and drilling more and whatever else … it is like a breath of fresh air. (Firefighter 28, male, 16 years' experience)

During quiet periods and downtimes, firefighters recounted how novices often acted as a reminder, facilitating the recall of deeply embedded tacit knowledge and skills. More experienced firefighters would talk novices through previous house fires, search and rescue techniques and topography. Tackling blazes in blocks of flats, cutting passengers out of crushed cars or dealing with chemical spillages were often shared through narrative, video or discussions. They would tell stories at the station kitchen table, in the

back of a fire engine or during training exercises laying out hose reels. Experience was imparted via narrative and aphorism to the probationer, and the very presence of a probationer acted as a catalyst that rejuvenated the CoP and aided the articulation of experiential knowledge.

Such 'war stories' were not simply a form of entertainment to pass the time during a quiet shift; rather, they were a key component of the way that firefighters learned. 'Storytelling' is an integral part of many CoPs and for firefighters the decline in live fires meant that learning vicariously through their experiences was a particularly vital part of skill development:

> In years to come we are going to have to learn off other people, some people's unique experience; there will be unique experiences, they are 'once in a career' for a few people, so if it happens in [names southern region] the lesson has got to be learned in Northern Fire [names Midlands region], wherever, because the chances are you will never face it yourself, but you must have that knowledge transferred. (Outgoing Deputy Chief Fire Officer, male, 29 years' experience)

In these CoPs, the presence of novices stimulated learning. This was true of both the practical tasks – where station managers, mentors and experienced firefighters worked to ensure that their own skills were up to scratch as well as supporting the novices' training – and the narrative and storytelling, which features so significantly in CoP practice.

Novices' active contribution: Practice and theory

Novices' roles were not entirely passive because they also made active contributions to the CoP, bringing energy and enthusiasm to their tasks; providing up-to-date theoretical knowledge of firefighting techniques; sharing expertise from previous occupations, which could help firefighting practice; and actively reminding their established colleagues of their own knowledge and skills. According to one station manager, it was the novices who were most likely to volunteer for tasks:

> The Brigade, the recruitment's gone like you said, there's a lot of old-timers here. I'd say three-quarters of the people aren't interested in promotion, you know you need new blood through to absolutely get that going and so it's the new blood then that'll want to go for things, want to be instructors for things and what have you, and want to go for promotion. I think the Brigade's getting a bit tired. (Station Manager, male, 23 years' experience)

When novices arrived in their stations, they had already completed a 16-week training course, so they brought with them the latest theoretical knowledge and skills, all of which the established firefighters were keen to learn. One example of knowledge introduced by novices cited by a number of stations was that of the Cleveland Load. This is a mechanism for tightly packing and condensing hose reel to make it easily transportable, particularly in high-rise buildings. The technique uses water pressure to stop the hose kinking as it unravels and requires just one carrier, thus freeing up firefighters to carry out other duties. Firefighters would practise the Cleveland Load during training sessions and improvise new techniques in making the hose reel more compact and tight.

The experienced informants also reported having developed their skills in the constantly evolving practice of casualty care, with novices supplying new medical guidance around heart rates for the injured and resuscitation positions; dealing with hazardous chemical spillages, since novices had current knowledge of chemistry and materials science; as well as the latest search and rescue techniques (significantly, novices' training had been extended from 13 to 16 weeks to provide more detailed guidance in these areas). Watches were trained on new developments, but novices were a powerful spur to this process.

Each of these new developments was of interest and novices' knowledge provided them with a seat at the table in professional discussions, even when the innovations they described were not immediately accepted. New clips had been introduced to link sections of hose and we observed a novice defending this development to an old-timer, with each presenting the advantages of their favoured system. Such discussions were a regular feature of work. As another novice observed:

> Training [at the academy] is where we get kind of taught the gold standard but it's not always; I mean, in practice, they [experienced firefighters] might cut out a couple of steps. (Novice 64, male, 3 months' experience)

Many newcomers brought other skills to their work. Previous recruits had prior occupational experience as joiners, motor mechanics or in construction. Firefighting is a practical craft and many of the respondents appreciated the benefits of these previous skills when breaking locks or cutting through steel in road traffic collisions:

> And then 'cos there's more people coming in, then for me it is knowledge, skill for me … it's like, 'Oh sh*t, I forgot about that'. So he's taught me something whilst I'm telling him something. Or we both don't know – right let's get it up on there then [points to training yard]. (Firefighter 28, male, 16 years' experience)

In all these fire stations, novices were regarded as an asset. Not even the firefighter who admitted that he would 'take the mickey out [of] old-timers' in the early stage of his career had anything critical to say about new recruits. Their presence enhanced the CoP's learning in a range of ways and, as one established firefighter observed:

> When people complain about 'Oh no, a new recruit and that', I think it is brilliant. It is because *it's making you*. (Firefighter 43, male, 12 years' experience; emphasis added)

The essence of the CoP is learning, and novices helped with every aspect of this: their presence stimulated tacit knowledge recall and they actively contributed both new 'textbook' knowledge and relevant experience from previous crafts and trades. The presence of a probationer was unifying for a watch, encouraging old-timers to reflect on and reaffirm practice, while at the same time learning new techniques from the probationer. This created a virtuous circle of sharing knowledge, constructing meaning and identity; it also acted as a cue for the recall of deeply embedded tacit knowledge and skills. Through this process, both novices and established firefighters learned. The novices were becoming firefighters; the established firefighters were honing their skills, having their stories

scrutinized, learning the latest techniques from the service's training course and getting an insight into the way experience in other occupations could assist with firefighting. For both, learning was continuous, with 'lessons' being passed round the CoP to the benefit of all its members.

Discussion and conclusions

Novices were key to CoPs. The majority of this research was conducted during a period of austerity when savage budget cuts were imposed on the UK Fire and Rescue Service, one consequence of which was an extended freeze on recruitment. During this time, none of the 12 stations observed had hired novices.

This lack of novices, coupled with a general lack of labour market mobility, had a clear, and negative, effect on the way that the CoPs operated and the ways that practitioners within them learned. Stripped of their new recruits, the established teams had less reason to train, less purpose in honing their own skills, no new audience for their narratives, less direct access to the latest theoretical developments, and no new group members to challenge and stimulate them. This is not to suggest that all learning and training stopped. All stations and watches trained regularly and the firefighters themselves were dedicated professionals who took pride in their work. Rather, with all these activities, novices acted as a spur to action: their recent studies, their previous work experience, their enthusiasm and their novelty all prompted the established professionals to build and reaffirm their own skills, as well as assisting the novices to develop. Firefighters would use narrative to relive and share operational or technical knowledge and experiences of major incidents. This was still possible in the absence of novices, but the prospect of telling and retelling the same stories in long-established groups was not attractive: both narrator and listeners would be less engaged; questions and fresh perspectives were less likely; and the encounter itself was likely to be stale. In such circumstances, long-standing firefighters' lack of enthusiasm is easy to understand.

Revealingly, the perspective taken here, that novices were valuable members of the CoP and that their absence was damaging to it, was informant-driven. At one level this might be considered counter-intuitive. Firefighters could have celebrated how experienced, established or seasoned their teams were; could have criticized novices as a distraction from 'real' work; or resented the resources put in to securing novices' competence. They did not. Rather, informants were unanimous in their positive views of the impact novices had on the CoP's dynamics. Speaking as professionals who spent a considerable proportion of their time in training for emergency situations, they actively wanted more novices and all maintained that the presence of novices enabled them to do their jobs more effectively.

These findings have implications for both theory and practice. Theoretically, there is a need to reframe existing assumptions about knowledge transfer in CoPs. This research demonstrates that learning and knowledge transfer within a CoP is a two-way bilateral process, challenging the idea that CoP learning occurs in a linear and sequential manner (Lave and Wenger, 1991). Old-timers learned from novices and novices learned from old-timers in a radial rather than a centripetal manner. This distinguishes CoPs from systems of education and vocational education and training where learning and working

are separate and distinct phases. In such formal systems, students are taught, knowledge is passed down hierarchically from teachers and learning occurs predominantly at the start of a working life. In CoPs, working and learning are integrated and inseparable. This is a context in which everyone learns, where knowledge and skills are shared, and where both periphery and core contribute. More broadly, the advantages described here were by no means exclusive to firefighting; the focus on a *community* of practice, rather than a hierarchy of teaching, itself suggests that knowledge flows in more than one direction. These findings reflect the fundamental workings of CoPs, raising implications for practice wherever skilled workers work, learn and share knowledge.

Redefining novices as active contributors to a community rather than passive recipients of knowledge has wider implications. The problems raised by the absence of experienced CoP members have been considered elsewhere (Grugulis and Stoyanova, 2011; Littler and Innes, 2003) and it is generally acknowledged that such a lack damages organizations (Tyler and Wilkinson, 2007). Here, those conclusions are extended and it is argued that removing novices also causes organizational problems. An ideal-type CoP includes workers at every stage of their professional development, none of which can be removed with impunity.

These lessons on the way CoPs can and do function are valuable, but they are also worrying. The austerity that stripped Northern Fire of its novices was not confined to that region, nor to the time this fieldwork was conducted. Many organizations have been deprived of novices, or journeymen, or experts, and more are likely to be similarly restricted in the future. Such slimmed down, hollowed out and de-knowledged firms (Littler and Innes, 2003, 2004; Tyler and Wilkinson, 2007) face challenges regarding the way that valuable knowledge and skills are transferred, developed and retained.

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