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To cite this article: Nicholas J. Tate & Claire H. Jarvis (2017) Changing the face of GIS education with communities of practice, Journal of Geography in Higher Education, 41:3, 327-340, DOI: [10.1080/03098265.2017.1315534](https://doi.org/10.1080/03098265.2017.1315534)

To link to this article: <https://doi.org/10.1080/03098265.2017.1315534>



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Published online: 14 Jul 2017.



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# Changing the face of GIS education with communities of practice

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## ABSTRACT

A principal focus in GIS higher education has been with developing curricula or accommodating new technologies to reflect the needs of the developing discipline. Pedagogy has largely reflected traditional metaphors of acquisition and transfer in the context of formal education, and this extends to preparation of students for the workplace. In this paper, the authors explore the potential for communities of practice, and in particular virtual communities of practice as a complement to more formal GIS education to provide a route to more situated, participatory learning. In so doing, the emphasis towards creating a GIS professional community of practice offers both the recognition of the role of situated knowledge in developing professional GIS expertise, and provides an important bridge from higher education to the workplace.

## ARTICLE HISTORY

Received 1 March 2016

Accepted 28 March 2017

## KEYWORDS

Community of practice; GIS education; higher education

## Introduction

In this paper, we explore how the concept of a “Community of Practice” (CoP) could be used to support learning in a Geographical Information Systems (GIS) context. The increasing ubiquity of GIS necessitates that alternative more flexible and varied approaches to learning GIS should be explored, to cater for those learners who may be remote from any sort of formal educational setting. The concept and theoretical development of a CoP recognises that the context of much learning is highly situated, socially collaborative, practice-based and effectively “on the job” (i.e. workplace-based). This includes the process of learning in Higher Education (HE), although this is contested, but applies in particular to learning beyond formal education. In this manner, CoP theory directly recognises the importance of the social *participation* metaphor for learning (after Sfard, 1998), and the tacit/procedural/non-declarative mode of knowledge generation. In contrast to more propositional/declarative learning in formal education (e.g. HE), CoPs are inherently social and informal where the focus is firmly on the practitioner and their practice. Although CoP theory has been widely adopted in a variety of contexts ranging from knowledge generation in the commercial workplace, to virtual collaboration between students and teachers in a variety

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of educational contexts, there is little to no application in Geography or GIS. We suggest that CoPs are well suited to the nature of GIS and GIS education in the twenty-first Century. Our aims in this paper are twofold: first to introduce an approach to learning which is congruent with the metaphor of participation, namely the CoP as introduced by Jean Lave and Etienne Wenger, and second to explore how CoPs and in particular *virtual* CoPs (VCoPs) might assist with the learning of GIS. We should stress that our concern with GIS education in this paper is primarily vocational, in recognition of its professional status, hence our attention is concentrated on those HE students who go on to professional careers using GIS. After sections describing both GIS education and pedagogic contexts, we define CoPs and VCoPs, and then suggest routes to utilisation in relation to GIS education, drawing upon appropriate literature and examples throughout to support our case.

### Context part 1: the changing face of GIS education

The early history of GIS education can be characterised as the efforts of individuals and small-scale collaborations amongst academics to define the knowledge domain, and fashion appropriate curricula (e.g. Clarke, 1988; Goodchild, 1985; Nyerges & Chrisman, 1989). Larger scale collaborations followed, again with a curricular focus, exemplified by the U.K.'s Royal Institution of Chartered Surveyors-sponsored *Curriculum for Teaching Geographical Information Systems* (Unwin & eight others, 1990), and the U.S. National Science Foundation-funded *NCGIA Core Curriculum in GIS* (Kemp & Goodchild, 1991). The latter was specifically motivated by the absence of appropriate instructional literature (Goodchild & Kemp, 1992), with the broad aim of facilitating the use of GIS (Kemp & Goodchild, 1991). A constant theme runs through many of these early publications, namely the need to provide formal educational support in order to satisfy the growing demand for GIS professionals in a recently developed profession.

Large scale collaborations concerning knowledge domain/curricular issues remain of contemporary interest, as evidenced by the development of the University Consortium for Geographic Information Science-sponsored *GIScience and Technology Body of Knowledge* (DiBiase et al., 2006), and more recent follow-up work, namely the *Body of Knowledge 2.0* (e.g. Wilson, 2014), and the European *Geographic Information: Need to Know* (GI-N2 K) project (Wallentin, Hofer, & Traun, 2015). This reflects the need for periodic curriculum revision, as what constitutes the GIS knowledge domain is progressively redefined and reconfigured over time. In part, this has been driven by technological development in GIS. Whereas GIS ca. 1989 required investment in bespoke GIS software and desktop computer hardware (e.g. Fisher, 1989), contemporary GIS has been influenced by two distinct but overlapping technological developments. First, is the increasing ubiquity of GIScience and Technology (GIS&T) which is now deployed in a wide variety of contexts from commercial/open source professional GIS to “GIS-lite” technologies such as mobile technologies and virtual globes (Butler, 2006; Tate, 2012). Second, is the influence of Information and Communication Technology (ICT), particularly the internet, World Wide Web and development of Web 2.0 applications (Batty, Hudson-Smith, Milton, & Crooks, 2010). The result, that we now have much wider access to GIS&T and the potential which Goodchild saw to “democratize GIS” (Butler, 2006, p. 777), is coupled with an unprecedented ability to collect and process digital geographic data, particularly what we might describe as “big data” (after Kitchen, 2013; Miller & Goodchild, 2015).

The nature and scope of GIS education has also expanded, reflecting some of the trends described above. Contemporary concerns include the broader context of spatial thinking/spatial literacy in education (National Research Council, 2006; Sinton, Bendarz, Gershmehl, Kolvoord, & Uttal, 2014), the emergence of open education (Belgiu, Strobl, & Wallentin, 2015; Sui, 2014) and the impact of professionalism (Lukinbeal & Monk, 2015). Whereas GIS education ca. 1989 was almost exclusively face-to-face in the classroom, the use of mobile, internet and web-based GIS are now a familiar part of the education landscape. ICT has also influenced the mode of GIS education delivery: distance learning courses in GIS are now common, and more recently, we have seen the emergence of geospatial MOOCs – massive open online courses (e.g. Belgiu et al., 2015; Robinson et al., 2015). Online learning resources such as stack exchange are a valuable but largely informal resource. Pedagogic developments have echoed the “hands-on” emphasis in much Geography education, characterised by active learning in the field and laboratory, and the adoption of Kolb’s experiential learning theory (Healey & Jenkins, 2000). As a result, GIS educators have adopted innovative approaches such as problem-based learning (Drennon, 2005) and participatory action research (Elwood, 2009) into HE GIS courses.

## Context part 2: the changing face of learning

Tidy maps of knowledge and learning are usually deceptive. (Eraut, 2000, p. 134)

Over a similar time period to the development of GIS education, there has been much effort put into understanding learning, where it takes place, along with related conceptualisations of knowledge. The tendency has been to move away from individual towards more sociocultural contexts for learning and knowledge construction. In the learning literature, there is frequent recourse to metaphors such as *acquisition*, *transfer*, *participation*, *construction* and *becoming* (e.g. Boud & Hager, 2012; Hager, 2008; Hager & Hodkinson, 2009; Sfard, 1998; Wegner & Nückles, 2015). The *acquisition* metaphor references more traditional notions of learning, described as “the common story about learning” (Hager, 2005, p. 649) or “the common-sense account of learning” (Hager & Hodkinson, 2009, p. 622) whereby learning is the rational process of the individual student acquiring context-free propositional knowledge. This view of knowledge has a long pedigree, and is equivalent to the *explicit* knowledge of Polanyi (1967 or the “know *that*” of Ryle, 1949; as described in Duguid, 2005) also described as *codified* knowledge (Eraut, 2000). This is the formal kind of knowledge and learning that we would directly associate with taught curricula (Kelly & Hager, 2015). As noted by Hager (2008, p. 680) acquisition is frequently accompanied by the metaphor of *transfer*. In this context, teaching is a largely unproblematic process of transfer of knowledge as a commodity from the teacher to the student. Analogies of student minds as “sponges” or “mental filing cabinets” that require filling (Bereiter, 2002 as quoted in Hager & Hodkinson, 2009, p. 622) encapsulate this view. In this context, the goal of education is that students are supplied “oven-ready” and preferably “self-basting” (Atkins, 1999, p. 274, single quotes in original) transferring their knowledge and skills from formal education through to post-education employment.

In contrast, more recent alternative views of learning as encapsulated in metaphors such as *participation*, *construction* and *becoming* treat knowledge (and learning) as less akin to information and as considerably more *social* and *situated* (Brown & Duguid, 2000; Hager,

2008) – in fact, far more *personal* (Eraut, 2000). Critically here, learning is seen as an ongoing process occurring not only in formal education, but more significantly beyond out into the workplace, taking on a significant informal dimension (Eraut, 2004; Kelly & Hager, 2015). Contrasted with propositional knowledge, these types of knowledge are described as considerably more *tacit* (after Polanyi, 1967), much more concerned with Ryle's (1949) dimension of “know *how*”. Often they are related to practice, and to social practice in particular. Although metaphors have a use, the relationship between learning metaphors and learning/knowledge is complex and nuanced (McGuiness, 2005), with some (e.g. Hager & Hodgkinson, 2009) contesting the continued value of acquisition and transfer metaphors to talk about learning. Viewing multiple metaphors as both necessary and complementary for understanding learning is central to the arguments that Sfard (1998) and McGuiness (2005) make for metaphorical pluralism in the learning process, and we would argue is critical for understanding the value of both “know *that*” and “know *how*” in formal and informal learning.

With the advent of the internet and Web 2.0 technologies, there has been considerable use of online technologies used to support learning, including blogs, wikis, podcasting (Kim & Bonk, 2006) and personal web technologies (McElvaney & Berge, 2009). Such technologies vary in terms of both the degree of synchronicity and the degree to which information transfer or more active/collaborative knowledge construction is the focus of the online learning (Means, Toyama, Murphy, Bakia, & Jones, 2009). There has been talk of new kinds of learning enabled by some of these technologies: *learning 2.0* (Brown & Adler, 2008) or *pedagogy 2.0* characterised by the focus on individual learner personalisation, participation and productivity (McLoughlin & Lee, 2008). Brown and Adler (2008, p. 32) suggest that “this new form of learning begins with the knowledge and practices acquired in school but is equally suited for continuous, lifelong learning that extends beyond formal schooling”.

## The community of practice

Learning *about* only requires the accumulation of knowing *that*, which confers the ability to talk a good game, but not necessarily to play one. (Duguid, 2005, p. 113)

In a climate of a general moving towards more *situated-ness*, a variety of different theories have emerged placing learning and knowledge generation in a more social context, more consistent with the participation metaphor of learning. One of these is the concept of a CoP. This was introduced in Lave and Wenger (1991) *Situated Learning: Legitimate Peripheral Participation* with a strong focus about how specific knowledge communities went about the sociocultural process of their own reproduction (p. 56). The emphasis here, is very much on identity, apprenticeships and how specific knowledge is generated in informal workplace settings. CoP theory has subsequently been developed, refined and applied in a wide variety of very different contexts from education to business and knowledge management. Amin and Roberts (2008) revealed an order of magnitude increase in CoP publications in the decade leading up to 2007.

As has been widely noted in the literature, one of the difficulties with CoP theory is the change in both definition and emphasis as the theory has developed over time. Etienne Wenger has described (in Omidvar & Kislov, 2014) a change of focus from Lave and Wenger (1991) where CoPs were more secondary to issues of identity and trajectory, in relation

to the journey of a novice becoming more knowledgeable within a defined community (*legitimate peripheral participation*), to more recent publications where they have become more centre stage. In Lave and Wenger (1991), a CoP is described as more intuitive (p. 42), a “set of relations among persons, activity and the world ... an intrinsic condition for the existence of knowledge” (p. 98). Subsequent publications including Wenger (1998) defined CoPs in more detail, including ideas such as *mutual engagement*, *joint enterprise* and a *shared repertoire* of resources. However, by 2004, they were described much more loosely as comprising “groups of people who share a passion for something that they know how to do, and who interact regularly in order to do it better” (Wenger, 2004, p. 2). Although CoPs are largely identified as informal and voluntary, Wenger, McDermott, and Snyder (2002) is often interpreted as a cook book for their implementation in a corporate context (e.g. Li et al., 2009). More recently the notion of “Landscapes of Practice” has been developed (e.g. Wenger-Trayner & Wenger-Trayner, 2015) in recognition of the multiplicity of different CoPs with which an individual might engage, and attendant focus on issues concerning identity, knowledgeability and boundary crossing in relation to an individual’s trajectory across such a landscape over time.

In the face of such volatility, the three dimensions identified by Wenger (2004) are perhaps most useful to get some sort of minimal purchase on CoPs. Here, we have a focus on *practice*, *community* and *domain*. Providing clear definitions of these key terms is a challenge. Practice is a key element of CoPs as suggested by statements such as “practice is an effective teacher and CoP an ideal learning environment” (Brown & Duguid, 2000, p. 127). However, exactly what is meant by “practice” is not straightforward. In an attempt to problematise the concept and provide a conceptual framework in the context of professional learning, Reich and Hager (2014) define six “threads” of practice of which the first they describe as “knowing-in-practice” is most useful here. This “views practice as a collective and situated process linking knowing, working, organising, learning and innovating” (Reich & Hager, 2014, p. 421). Workplace learning in an emergency hospital context is supplied as an example, suggesting that “knowing-in-practice” might be synonymous with the expertise and professional knowledge developed in the workplace which is more tacit and more concerned with elements of “know *how*”.

CoPs are strongly rooted in the *social*: the focus is away from the individual and towards the individual’s participation in a community. Learning here is seen as being intrinsic to social practice (Fuller, Hodkinson, Hodkinson, & Unwin, 2005). Defining “community” is also not straightforward – an issue which recurs throughout the edited volume *Designing for Virtual Communities in the Service of Teaching* by Barab, Kling, and Gray (2004). At issue is whether the label “community” is appropriate to a particular learning context. The point is moot, not helped by relaxed use of the term in very different contexts (Kling & Courtright, 2004). There is additional difficulty with defining “learning community”, with different types associated with different contexts. For example, Riel and Polin (2004) suggest that different learning communities can be characterised as *task-based*, *practice-based* and *knowledge-based*, with the practice-based perhaps the closest to the concept of a CoP.

Issues of identity, and changing identity within the community are significant. Lave and Wenger’s (1991) *legitimate peripheral participation* describes the process of acculturation within a given CoP, where novices learn to be master of particular professional or skilled community. Brown and Adler (2008) describe this as the process of “learning *to be*” (in contrast to “learning *about*”). Indeed, the specific case studies identified in Lave



and Wenger (1991) namely Yucatec midwives, Vai and Gola tailors, naval quartermasters, meat-cutters and non-drinking alcoholics, are arguably all clearly defined communities, with clear novice-master identities. However, in more recent work, notions of individual identity and peripheral participation are also considerably more nuanced such that relative to a particular community (or CoP) individuals might only ever be classed as “tourists” and pass through it without ever attaining a level of expert participation that is more than just peripheral (Fenton-O’Creevy, Brigham, Jones, & Smith, 2015).

Lastly, is the specific domain which we might consider as the immediate context of learning/knowledge generation. The literature on CoPs describes a wide variety of contexts in which CoPs have been instantiated. In a review of the CoP literature to date, Amin and Roberts (2008) suggested that the term CoP described such a variety of contexts that it was becoming less useful as a descriptor. They identified four distinct categories for what they termed more generally as “knowing-in-action”, namely *craft/task*, *professional*, *epistemic/creative* and *virtual*. Of these, the first two are most closely associated with the traditional notion of a CoP reflecting knowledge embedded in work practice which includes significant kinaesthetic and embodied elements, and the strongest social ties (Amin & Roberts, 2008). The *craft/task-knowing* category in fact contains some of the archetypes of apprentice-based learning communities. Classic examples are naval quartermasters (Lave & Wenger, 1991), and photocopy repair technicians (Orr, 1996). Examples of the *professional* category reference the health (Andrew, Ferguson, Wilkie, Corcoran, & Simpson, 2006) and teaching professions (Blanton & Stylianou, 2009; Viskovic, 2006), and for the *epistemic* category, a recent example is NASA scientists (Davey, 2013). Of particular interest in the context of this paper, is the relationship between CoPs and formal education, specifically HE. It would seem that where the focus is on teacher professional practice, the CoP label fits better (e.g. pre-service teachers in Barab, MaKinster, & Sheckler, 2004; Geography teachers described by Chalmers & Keown, 2006; Keown, 2009 and GIS teachers described by Unwin & Tate, 2008). However, whether this label can be applied to student learning in the classroom is more contested. Concern hinges on whether groups of what Roth and Lee (2006) describe as “monads” (i.e. students) traditionally concerned with their own individual success can be considered to be a community, and whether the terms of their participation (usually involuntary) and identity relationship in relation to their teachers, mean they can be seen as a CoP are unclear (Riel & Polin, 2004). Nevertheless, there are examples where the CoP model has been directly applied to students in HE (e.g. Masika & Jones, 2016).

## Virtual communities of practice

The extension of CoPs in learning contexts which are not co-located leads to the definition of a virtual CoP (VCoP) whereby the interaction between participants is more distributed and communication takes place at a distance, usually via ICT. Amin and Roberts (2008, p. 357) describe this as “social interaction mediated through technology”. A recurring theme in much of the literature is that VCoPs are one mechanism to overcome work-related isolation. Various reviewers (Barnett, Jones, Bennett, Iverson, & Bonney, 2012; Davey, 2013; Dubé, Bourhis, & Jacob, 2006) have attempted to identify both the differentiating/diagnostic characteristics and different types of VCoP, with Dubé et al. (2006) identifying 21 differentiating characteristics organised into four groups: *demographic*, *organisational*, *membership* and *technological environment*. These encompass issues concerning moderation/facilitation

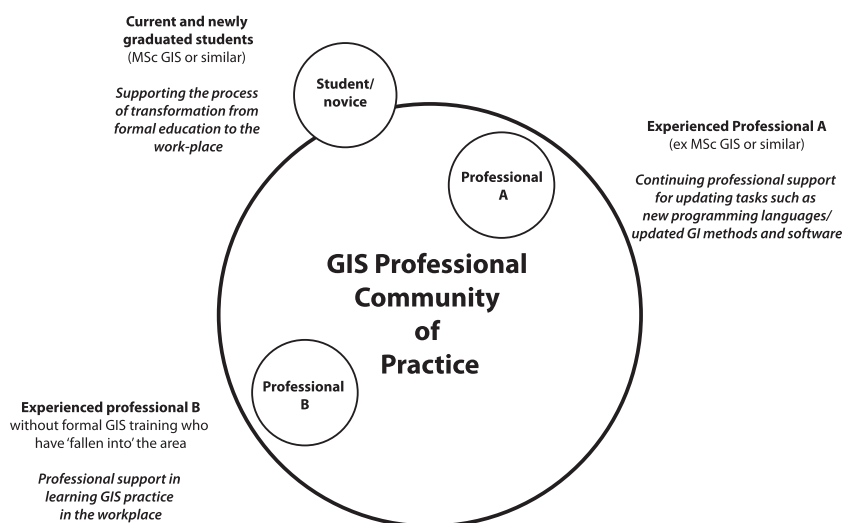
(for examples see Cooper, Grover, & Beth, 2014; Mendizabal, Solinis, & González, 2014) the degree of intention (see Lee-Kelley, Turner, & Ward, 2014) and the involvement of different professional groups or organisations (see Fung-Kee-Fung, Boushey, & Morash, 2014). Whether or not a VCoP – with inherently weaker social ties (Amin & Roberts, 2008) can support what Jewson (2007, p. 156) terms the “‘thickness’ of social interactions” common to CoPs is moot.

Nevertheless, VCoPs do make use of much of the social apparatus of Web 2.0 (see Kamel Boulos & Wheeler, 2007). A VCoP may additionally have links to MOOCs with a view to updating the learning of the stakeholders, placeholders for resource downloads, wikis, event listings or a people searcher. Examples of VCoPs are particularly common in healthcare, for example Connect GPR which is a VCoP for reducing isolation amongst trainees (Barnett et al., 2014) and HOBE+, a VCoP to support innovation in primary care in Basque Public Health Service (Mendizabal et al., 2014). Examples are also common (similar to CoPs) in teaching and HE with the aim of updating domain knowledge and expanding teaching skills (e.g. Tseng & Kuo, 2014). Other examples include IONiC (Interactive Online Network of Inorganic Chemists): a CoP for both teachers and students of inorganic chemistry structured around face-to-face meetings and a website which contains materials and social networking tools (Benatan et al., 2009), and Wikivet (Brown, Quentin-Baxter, & Belshaw, 2010) for veterinary schools. Closer to the fields of GIS and education is Cooper et al.’s (2014) virtual CoP for K-12 Computer Science teachers involving example code and information concerning algorithms. Within the HE sector, Pharo et al. (2012) report less success with their VCoP to encourage interdisciplinary practice, citing lack of resource as the principle reason for failure.

## Discussion: CoPs in GIS education

Returning to the context of this paper, what role could CoPs (and VCoPs) play in the context of GIS education? One model could be that students in education constitute a distinct type of CoP whose practice is concerned explicitly with learning GIS. We have already noted above that the nature of education/HE provides conceptual difficulties for CoPs where student participation and practice is concerned. A more persuasive model could be the identity of GIS students as apprentices relative to a workplace CoP (Figure 1), which we might associate with the term “GIS professional”. Significantly, we are moving away from the view of formal education as supplying the student with the requisite skills which are then transferred to a workplace context: “Having learnt it in class and in the educational laboratory, students go out into the real world to do it” (Forer & Unwin, 1999, p. 753). Instead, there is considerable overlap between the boundary of GIS education and boundary identifying the world of work, in part, reflecting the strong vocational element to GIS education (e.g. Whyatt, Clark, & Davies, 2011), particularly at taught postgraduate (Masters) level. Here, evidence suggests that GIS skills learnt as part of formal HE have considerable value in the workplace (Wikle & Fagin, 2015) as have associated professional skills (Lukinbeal & Monk, 2015). This is evident in the development of competency models such as the U.S. Dept of Labor’s *Geospatial Technology Competency Model* which identifies skills and knowledge with professional workplace roles (DiBiase et al., 2010). Augmenting active learning approaches, the creation of opportunities for students to take internships or work placements (what we might term “work based experiences” after Smith, Clegg,





**Figure 1.** GIS professional community of practice.

Lawrence, & Todd, 2007) as part of formal education is one reflection of this (Lukinbeal & Monk, 2015). For example, the *Geospatial Technology Apprenticeship Program* which bridges between HE and work (Gaudet, Annulis, & Kmiec, 2010).

Creating opportunities for interaction in the context of a professional CoP, perhaps in a virtual form as a VCoP, is another more informal response to the blurring between GIS education and GIS professional work, recognising nascent boundary crossing and changing identity to a graduate and a novice professional. The career of “Student/novice” may take a trajectory towards “Professional A” in Figure 1. Here, we might envisage a CoP as a vehicle for the GIS learning community beyond formal education, offering an alternative to more formally re-engaging with education. In addition, we might envisage a CoP as a route to learning GIS for those without formal GIS qualifications (“Professional B” in Figure 1).

Moving towards the potential merits of a VCoP for GIS within a HE context, following Amin and Roberts (2008), differentiation of types of knowledge is key. In their paper, they distinguish between the initial phase when professional knowledge requires learning within a formal co-locative environment and a later, less spatially dependent declarative knowledge phase in which new learning can be situated within the initial framework and where radical innovation is stimulated by contact with other communities, but where this could be co-located or virtual. This sets the groundwork for thinking about a VCoP for those emerging from a postgraduate education in GIS where professional frameworks and foundational knowledge have been laid, but will need development because any one GIS Masters course cannot possibly cover all aspects of the GIS&T *Body of Knowledge*. There is a potential need for a VCoP to aid bridging from education to work in established areas, for example to use an alternative coding language or piece of software. Supportive bulletin boards for those new to R, JavaScript or Python coding might sit aside algorithms for visual analytics and the cleaning of big data or a repository for the latest in open access research papers. In terms of radical innovation, the conference or workshop still retains an important place.

A significant caveat was noted by one of the referees to this paper, online *interaction* is not the same as online *community*. If we accept Barab, MaKinster et al.’s (2004, p. 55) definition

of an online community as “a persistent sustained [socio-technical] network of individuals who share and develop and overlapping knowledge base, set of beliefs, values, history and experiences focused on a common practice and/or mutual enterprise” this may guide the formation, structure and identity of such a VCoP, and differentiation from other types of learning community. Exemplars from the health industry show primary care groups coming together to form VCoPs, while other structures include those promoted within one large organisation, the latter being the initial model for the CoP. In terms of HE providing CPD post-graduation, we might see different providers set up their own VCoPs, incorporating alumni, to provide both ongoing skills development and the employability both in the short and longer term for their graduates. The competitiveness of the sector makes it unlikely that one university would offer to run a universal VCoP, although the same might have once been said of the now ubiquitous MOOC as a loss-leader to profile their innovative teaching and learning environments. The example of WikiVet (Brown et al., 2010) – set up as a collaboration of all U.K. veterinary schools – may be a useful template.

## Conclusion

In conclusion, we suggest that much GIS education is rooted in traditional acquisition and transfer learning metaphors associated with formal education. In this view, formal learning provides the only route to learning about GIS, and CPD or further education would by necessity require reconnection to formal learning in some form. As educators in HE we recognise the role that formal learning plays in the education process, however the key point of this paper is to foreground the role of informal learning, and specifically that engendered by the CoP. In recognition that much learning is situated, social, informal and tacit, CoP theory offers the potential of a bridge from HE to the workplace, whereby on-going skill acquisition is obtained directly in the context of use. Whilst we accept that the specification of formal curricula such as the GIS&T *Body of Knowledge* has a useful purpose, we suggest that the support and nurturing of GIS CoPs – which extend beyond formal education- offers the promise of nurturing learning and providing support in a more life-long manner. However, in the growing literature on informal learning it is clear that CoPs offer only one lens with which to view a more expansive conception of learning. A research priority is to examine the value of alternative social learning theories and other types of learning community associated with the “Professional Learning Community” (PLC) familiar from the literature, in the context of GIS education. Activity theory championed by Engeström (2001) may also prove a useful tool to clarify the relationship amongst the various components in a GIS professional CoP or VCoP.

The promise offered by CoPs also needs to be evaluated in the face of some criticism, in particular around changing theory and loose definitions (Amin & Roberts, 2008; Cox, 2005) and the underdevelopment of issues such as power relations and trust (e.g. Roberts, 2006). In addition, there has been some concern that CoPs appeared to have been developed in reaction to the acquisition and transfer metaphors, and therefore the theory undersells the role of more formal teaching in the learning process and oversells social interaction (Fuller et al., 2005; Hammersley, 2005). Whilst we recognise this concern, we have stressed throughout that CoPs and more situated social learning complements rather than replaces more formal education couched in terms of learning as acquisition, which ameliorates this concern to some degree.

## Acknowledgements

We thank Dave Unwin for being a useful sounding board for some of the ideas which led to this paper. We also thank the helpful comments from two reviewers which significantly improved the paper. Nicholas Tate would also like to thank the University of Leicester for a period of study leave during which some of the research for this paper was undertaken.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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