

Central practitioners' developing legitimate peripheral participation in a community of practice for changing schools

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As new technologies continue to shape society, there has been a greater need for communities of practice to facilitate changing teaching and learning practices through technology in schools. Legitimate peripheral participation through these communities of practice has become an essential means to spread and support this technology integration movement, but understanding this participation in communities has been limited. This paper reports on a study of how central practitioners developed legitimate peripheral participation episodes in an inter-organisational, international community of practice. It describes the qualitative, case study approach to the study, and outlines the community of practice, its central practitioners and the legitimate peripheral participation episodes in which they participated. The paper presents and discusses essential central practitioner individual and organisational factors which enabled the continuity and change of legitimate peripheral participation episodes in the community. Individual factors to emerge from the study include central practitioners' desire for continuous professional development and individual agency. Organisational factors include an organisation's distinctive mission, its distinctive roles, and constant negotiation, including conflicts of interest, between organisations and their members. The paper concludes with considerations of the value and relevance of legitimate peripheral participation in an inter-organisational community of practice for changing practices.

Introduction

The need for schools to change teaching and learning practices through technology has grown as new technologies continue to impact society (Hargreaves, 2003; Postman & Weingartner, 1969). However schools vary greatly in their awareness of technology in curricula (Davis, 2008). At an individual level, awareness of technology in teaching and learning practices may vary greatly based on knowledge of technologies and pedagogies.

Social learning through communities of practice (CoPs) and legitimate peripheral participation (LPP) (Wenger, 1998) are an established means to change teaching and learning practices through technology in schools. However reflecting the present educational and political landscape of technological pedagogical change in schools, the literature often presents communities of practice as silos. Institutions often operate alone in their capacity building, but sometimes they cooperate with similar institutions. For instance, the literature provides several examples of cooperation between higher education institutions in Cambodia (Dionys, 2102), Australia (Romeo, Lloyd & Downes, 2012), Vietnam (Peeraer & Van Petegem, 2012), and Greece (Jimoyiannis, Tsiotakis, Roussinos & Siorenta, 2013). This literature limits understanding of capacity building through LPP in communities to formal categories, for instance, school roles, schools and nations. There is a need to understand building technological pedagogical capacity not only in teachers but also in other school stakeholders, all of whom could become central practitioners in the community. There is also a need to understand building technological pedagogical capacity not only in a single institution or similar institutional categories but within a diverse range of organisations. A more holistic, broader or metacognitive approach to foster support structures and networks (Peeraer & Van Petegem, 2012) which could support educators' learning beyond their involvement in categorical silos, or formal communities is warranted.

This paper reports on a study of how LPP episodes in an inter-organisational CoP for changing teaching and learning practices through technology developed through its central practitioners. This study differs from previous work in that it identifies a set of essential individual networks and organisational structures which enable the continuity and change of LPP episodes in this CoP. It assumes LPP in a CoP is not static, but is a dynamic process over time. This paper also informs practitioners and organisations about discreet qualities to aid the policy and practice of supporting and scaling LPP in a CoP for changing practices in changing schools. This paper addresses the following the research questions:

- What individual and organisational factors of central practitioners enable continuity and change in the LPP episodes of an inter-organisational CoP?
- What is the relevance and value of LPP in an inter-organisational CoP for changing practices in changing schools?

Literature review

Communities of practice

Social learning theory has influenced greatly technology integration in schools. In particular CoPs are a prominent means by which schools facilitate and sustain technology integration, and improve professional practice (Hsu & Sharma, 2008; MacDonald, 2008). By a CoP, this study refers to a group with a coherent mutual engagement, joint enterprise and shared repertoire (Wenger, 1998), along with distinctive orientations (Wenger, White & Smith, 2010). CoPs are a rich source for professional learning (Duncan-Howell, 2010) because of the constant negotiation of new knowledge (Schwier, Campbell & Kenny, 2004). They are also a central vehicle for pooling and disseminating technological pedagogical expertise within and between educational institutions (Fishman & Davis, 2006). These social learning groups contrast a command-and-control approach where knowledge is neither contextualised nor personalised (Jameson, Ferrell, Kelly, Walker & Ryan, 2006), and a silo-style approach where organisations and individuals do not share knowledge well. In general, CoPs are an important approach to overcoming complex barriers to technology integration in schools (Kopcha, 2010).

In the past decade, the impact of new technologies in society has led to the emergence of new types of CoPs in education. New technologies have transformed membership compositions and communication means of CoPs. Many CoPs are online exclusively and can gather a range of practitioners by overcoming geographic and temporal constraints. Similarly the prominence of technology integration in educational institutions has resulted in the forming of highly specialised CoPs. Many CoPs in education are role-specific, such as CoPs for instructional designers (Schwier et al., 2004), secondary school teachers (Fuller, Hodkinson, Hodkinson & Unwin, 2005) and pre-service teachers (Yang, 2009), or for teacher professional development (Tsai, 2012) at grade or subject levels (MacDonald, 2008). CoP boundaries nonetheless remain imprecise (Fuller et al., 2005). Gaps in the literature exist, and understanding of these types of CoPs is only emerging. Studies are needed of CoPs where members are not exclusive to a type of school role or subject (i.e. discipline) but whose mutual engagement is to negotiate the support of changing teaching and learning practices through technology in schools.

Central practitioners in communities of practice

Social learning literature has also been developed on the practitioner roles within CoPs to facilitate technology integration in educational institutions. A number of analogous frameworks have been developed to describe these types of practitioners, who have been coined as *romantics* (Postman & Weingartner, 1969), *champions* (Allan & Lewis, 2006), *cognitive masters* (Collins, 2006), *coaches* (Fishman & Davis, 2006), *change agents* (Hsu & Sharma, 2008), *mentors* (Kopcha, 2010), *technology stewards* (Wenger et al., 2010), *motivated teachers* (Peeraer & Van Petegem, 2012) and *ICT focal point people* (Dionys, 2012), among other names. While these frameworks differ to degrees, they share similarities. They identify individual qualities necessary for practitioners to sustain changing teaching and learning practices through technology in schools.

This paper refers to these instrumental practitioners as central practitioners. Generally these central practitioners may possess great technological pedagogical expertise, or great knowledge in certain combinations and domains of technology and pedagogy (Kopcha, 2010). This can also be referred to as *geeking out*, "an intense commitment or engagement with media or technology, often one particular media property, genre, or a type of technology" (Ito et al., 2010; p. 65). Additionally, there are elements of personal mastery (Senge, 2000), personal and professional transformation (Schwier et al., 2004), non-transactional leadership (Kopcha, 2010), local leadership (Dionys, 2012) and a major entrepreneurial aspect to these roles: people sell changing practices to others (Ito et al., 2010). To receive support in spreading changing practices, these entrepreneurs also leverage their social networks, which may extend

beyond the school community and reach into the multiple CoPs to which these people belong (Dawson, 2010; Wenger et al., 2010). These central practitioners are not *lone rangers* (Bates, 2000) who work in isolation or in a vacuum to change practices. Furthermore the ways by which these people disseminate knowledge are situational and relational, and therefore although these people are recognised as experts in combinations and domains of technology and pedagogy, they are by no means absolute experts in these areas (Wenger et al., 2010). These central practitioners guide and scaffold practice (Collins, 2006; Fishman & Davis, 2006), but the scope of involvement in disseminating changing practices may vary by the participants (Fuller et al., 2005) and by the innovation, from casual sharing to intensive, hands-on application of technology to pedagogy (Ito et al., 2010). These central roles can often be informal and voluntary (Ito et al., 2010; Mylläri, Ahlberg & Dillon, 2010; Wenger et al., 2010). The extent to which practitioners exemplify these qualities is the extent to which the practitioners can be considered central in a CoP for changing teaching and learning practices through technology in schools.

While many analogous frameworks have been developed to describe central practitioners, these frameworks tend to be generic without specific details and research to describe the actual practice of leveraging a CoP to facilitate changing teaching and learning practices through technology in schools. How a central practitioner actually goes about changing practices through a CoP is emergent and not well understood, especially in view of new types of CoPs to which these central practitioners may belong.

Legitimate peripheral participation

LPP describes the process by which a person becomes a member of a CoP and ultimately moves from a marginal practitioner to a central practitioner. In this process identities and relationships change, which result in increasing degrees of learning, commitment and participation for members (Tsai, 2012). Leadership is extended and transferred to new members of the CoP (Kopcha, 2010). LPP is significant because it grows and sustains the community.

Literature on LPP has positioned time as an important mediator in this process: the longer a person engages a CoP, the more a person moves naturally from the CoP's periphery to its center (Kopcha, 2010). Sources of the community's practice also mediate the position of a member in the community. Novices need exposure to mature practice (Sorin, 2004) and the more a member can access mature practice, the closer a member moves from the community's periphery to its center. In terms of supporting changing teaching and learning practices through technology in schools, central practitioners are a source of mature practice and they can serve to initiate or familiarise people to the community. Nonetheless, LPP should not be considered a linear process: peripheral participation is relative and situational (Fuller et al., 2005).

LPP in CoP is a useful conceptual framework by which to study the support of changing teaching and learning practices through technology in schools. While it has helped frame developing technology integration ability in novices, laggards or marginal members of communities and schools (Hung, Chee, Hedberg & Thiam Seng, 2005), less attention has been paid in this research area to how these LPP episodes develop in practice over time. A longitudinal perspective is lacking in literature on technology integration through CoP (Hsu & Sharma, 2008). The relevance and value of LPP in CoPs also needs addressing (Fuller et al., 2005). Additionally when attention has been paid to the development of LPP, the marginal members were an exclusive body, such as secondary school technology teachers in Fuller et al.'s (2005) study or Slatter and France's (2011) study. As demand for changing teaching and learning practices through technology in schools grows, so the demand for LPP in CoPs for all school stakeholders will grow. It is important to understand not only how access to mature practice through LPP episodes with central practitioners are created but also their value and relevance for changing practices through CoPs.

Methodology

This study features the case of an inter-organisational CoP. A qualitative case study research approach (Stake 1995) has been common in studying CoPs for technology integration (Fuller et al., 2005; Hsu & Sharma, 2008; Slatter & France, 2011). The purpose of the approach is to build analytical generalisations, or theory, grounded in data. In this case, the purpose is to build theory on how central practitioners develop LPP episodes in a CoP and to relate that to changing practices in changing schools. The case

provides depth to the answers to the research questions not least by providing the central practitioners in this study with a voice. This is important because the research questions are concerned with individuals and organisations, relevance and value in a community with its central practitioners as its leaders. The case also influences the iterative and interpretive methods to provide answers with depth and central practitioners with voice, for which a survey may not have been appropriate. The methodology sections describe the characteristics of the CoP and its central practitioners, the boundaries of the case and rationale for them. The discussion section describes some limits to understanding the boundaries of the case.

Characteristics of the community of practice

This study examined the development of LPP episodes in an inter-organisational, international CoP. This community's mutual engagement is to facilitate changing teaching and learning practices through technology in schools. In other words, full practice or full membership in the community is to provide and to learn to provide members with pedagogical support for teaching through technology in schools. Community members included teachers, principals, administrators, other occupational groups, and parents from primary and secondary schools, mainly international private schools, not only in Hong Kong but generally from the Asia region. Members also included representatives of universities, businesses or professional organisations which also support changing teaching and learning practices through technology in schools in the region. How this community originated is not clear but CoPs can be spontaneously evolving (Jameson et al., 2006).

Characteristics of the central practitioners

The central practitioners selected for this study belonged to an emergent occupational group. This occupational group's primary responsibility is to help teachers and other school stakeholders to use technology to best support student learning, taking into account knowledge of technologies and pedagogies. Although the central practitioners came from teaching backgrounds, they were not teachers in a traditional sense because they were not necessarily assigned a specific content area, a year group, or class to teach. They had great choice in deciding who to teach or to support, both within and beyond the school organisation, but this work was aligned with the school's technology integration plans. These central practitioners' official job titles were ICT Facilitator, Head of Teaching and Learning Technologies, ICT Curriculum Leader, Learning Technology Adviser, and Learning Technology Coordinator. These job titles convey the distinctiveness of their organisational roles and this emergent occupational group.

The ICT Facilitator, the Head of Teaching and Learning Technologies, the ICT Curriculum Leader and the Learning Technology Coordinator were each employed, but not exclusively, by the primary school sections of international private schools in Hong Kong. The Learning Technology Adviser was employed by a school confederation which operates international private schools in Hong Kong. The ICT Facilitator and the Head of Teaching and Learning Technologies were also employed as part-time lecturers by a university in Hong Kong. The ICT Facilitator was also an Apple Distinguished Educator and delivered professional development and consultation to educators in Asia on behalf of Apple and her own consultancy. The Learning Technology Adviser was also the founder and director of an education non-profit organisation which hosts education conferences in Hong Kong primarily for international private school educators in the Asia region, including the annual meeting for the CoP.

The Head of Teaching and Learning Technologies, the ICT Curriculum Leader and the Learning Technology Adviser were introduced to this study by a research project supervisor. The ICT Facilitator was introduced by the ICT Curriculum Leader. The Learning Technology Coordinator was introduced by the ICT Curriculum Leader and the ICT Facilitator. These central practitioners and their CoP form a convenience sample as they emerged from a wider study of this emergent occupational group's impact on teaching and learning practices in schools. Many schools may not employ people within this occupational group and a CoP with such purpose and membership may not exist outside this context. Similarly these central practitioners may not be the only central members of the CoP, and not all central practitioners in the CoP may be a part of this emergent occupational group.

Data collection and analysis

Data for the case were collected from observations of 25 discreet LPP episodes involving the central practitioners interacting with other community members. Data were also collected from 23 semi-structured and unstructured interviews with the central practitioners and semi-structured interviews with other community members involved in the LPP episodes. These other community members included principals, administrators, parents, students, teachers and other representatives from several organisations. Central practitioners' documents including social network profiles, blogs and Twitter feeds triangulated data from LPP episode observations and interviews. These LPP episodes were not leads for new LPP episode observations or interviews.

Data were collected over 9 months. All data were triangulated by other data, the judgment of the researcher and participant checking. Participant checking provided a means for further discussion on and clarification of data: all interviews and central practitioner comments from observations were digitally recorded, transcribed and checked by relevant participants; and summaries of observations and document analysis were also written for participant comment and verification.

Since the nature of the wider research project was exploratory, data collection and analysis for this study were grounded. Grounding data collection and analysis (Seale, 1999) is a data-driven approach which puts the data before the question and not the converse (Hung et al., 2005). It also actively engages the researcher in data collection and analysis (Schwier et al., 2004). The initial stage entailed initial, unstructured interviews with the central practitioners. In these interviews, after the study was explained to them, these central practitioners were asked to talk about their work. They were then asked clarification questions about the people and events they would mention in their responses. While people to interview and events to observe from these practitioners' responses were identified, central practitioners would also make unsolicited recommendations on people to interview and events to observe. Episodes to observe were agreed upon based on participant availability and opportunities for learning: intrinsic appeal and rich data. Secondary participants to interview were also agreed upon based on their availability and their school role. The purpose in interviewing other stakeholders was to identify the ways and events by which the central practitioners impact teaching and learning practices in schools, and to clarify interactions between these stakeholders and central practitioners. Subsequent data collection instances ensued from opportunistic snowball effects. Central practitioners and other stakeholders could make unsolicited recommendations for people to interview and events to observe. Notes from these initial observations and interviews were open-coded and could also identify people and events for possible data collection.

Table 1 presents data on the ICT Facilitator's involvement in LPP episodes in chronological order. The table illustrates representative patterns and characteristics of LPP episodes from the study and also the iterative nature of data collection. The table presents per each LPP episode an overview, other community members involved and the organisations involved.

Data were axial-coded through NVivo. Categories of events that the central practitioners attend, the organisations, organisational roles and individuals present at these events, and the foci of these events were coded. The more data were collected, the more the primacy and validity of specific event types, organisations, roles, individuals and foci were established. This analytical technique of reducing a large number of concepts and validating them has been prevalent in applying qualitative methods to researching CoPs (Mylläri et al., 2010). In this way, The CoP, its international, inter-organisational nature, its technological pedagogical orientations and its central practitioners were identified. LPP events and central practitioners were also identified from observing interactions between practitioners and interviews with practitioners who were asked about their interactions with other practitioners. This data analysis informed further data collection instances in terms of which people to interview and which events to observe to collect confirmatory and contradictory data of the nature of the community and its events.

Table 1
A list of the ICT Facilitator's legitimate peripheral participation episodes

Technological pedagogical expertise	Episode synopsis	Other community members	Organisations
Apple technology; Scratch	Project feedback meeting for collaboration between a primary school (PS), Apple, a professional organisation (PO) and the ICT Facilitator's PS	Consultant from the PO; consultant from Apple; teachers and principal from a PS	An American PO; Apple Hong Kong (HK); a HK mainstream PS; ICT Facilitator's HK international PS
Apple technology: Mac migration	Planning meeting for professional development sessions (PDS) at a PS and for the participation of the PS in the Learning Technology Adviser's non-profit organisation's conference (NPOC)	Two technology leaders from a PS	ICT Facilitator's HK international PS; Apple HK; an international HK PS; the Learning Technology Adviser's regional NPOC
Apple technology: iPad apps	PDS for all schools from the Learning Technology Adviser's school confederation (SC)	Teachers, administrators and principals from the Learning Technology Adviser's SC	ICT Facilitator's HK international PS; Apple HK; Learning Technology Adviser's HK SC
Apple technology: iPad apps	Benchmarking lesson for reception year students in ICT Facilitator's PS	Students from ICT Facilitator's PS	ICT Facilitator's HK international PS
Apple technology: iPad apps	PDS for schools belonging to Learning Technology Adviser's SC	Learning Technology Adviser; ICT coordinators and teachers from Learning Technology Adviser's CS; consultant from Apple	ICT Facilitator's HK international PS; Apple HK; Learning Technology Adviser's HK SC and regional NPOC
Scratch	Team-teaching lesson for a geometry class in ICT Facilitator's PS	Teacher and students from ICT Facilitator's PS	ICT Facilitator's HK international PS
Scratch	Team-teaching lesson for a geometry class in ICT Facilitator's PS	Teacher and students from ICT Facilitator's PS	ICT Facilitator's HK international PS
Apple technology	Leading a tour of ICT Facilitator's PS for Learning Technology Adviser's NPOC primary teaching strand participants	Learning Technology Adviser's NPOC primary teaching strand participants	ICT Facilitator's HK international PS; Learning Technology Adviser's regional NPOC; and participants' regional schools and other organisations
Apple technology: iPad apps	PDS for Learning Technology Adviser's NPOC participants	Learning Technology Adviser's NPOC primary teaching strand participants	ICT Facilitator's HK international PS; Learning Technology Adviser's regional NPOC; and participants' regional school and other organisations

Findings

This section explores the data relevant to understanding central practitioners' development of LPP in a CoP for changing teaching and learning practices through technology in schools. The central practitioners' individual and organisational factors which enable the continuity and change of LPP episodes in a CoP and which emerged from the data are presented. Representative quotes illustrate well each individual and organisational factor from the case.

Individual factors

Continuous professional development

Through content analysis central practitioners' propensity for certain domains of technology and pedagogy when supporting LPP in the community were identified. At the same time, Table 1 delineates several lines of technological pedagogical expertise, often being demonstrated by central practitioners' in tandem. In the main, the continuity of technological pedagogical expertise in LPP episodes stems from central practitioners' interest in continuous professional development and reflective practice. Through the social construction and negotiation of new knowledge in LPP episodes, this supports findings from Fuller et al. (2005) and Peeraer and Van Petegem (2012) that newcomers play a role in teaching central practitioners and fostering mutual professional learning respectively. These episodes may also support Schwier et al.'s (2004) assertion that LPP makes explicit much tacit, craft knowledge that participants would not otherwise recognise and manifest. For example, the Head of Teaching and Learning Technologies commented on why he has developed his digital storytelling expertise at several CoP LPP episodes:

That's very much we make it up as we go along. I just do it because I want to know about digital storytelling. The only way I can do that is by teaching the kids, claiming to teach them something! I really wanted to explore digital storytelling because I had read a lot about it and thought, it's not going to make much sense to me unless [I do it] ... messing and exploring.

The ICT Facilitator claimed that non-central practitioners' engagement or disengagement was time and technology insensitive; in other words, as she has spent many years facilitating LPP for technology integration in schools, first with laptops and now with handheld devices, she has faced success and resistance regardless of technologies. This central practitioner has accepted varying degrees of engagement and willingness in the community and has said:

I'm aware that with some people I am [successful] and with other people I'm not. It depends on their perceptions, attitudes and beliefs about technology. Like anywhere, there are people who are resistant even though they tell me they're not resistant. And there are people who find it threatening having me work with them in class because they're not used to having someone there. So there are the usual issues; and the usual successes and the usual failures.

Nevertheless, the ICT Facilitator added that the degree of engagement in an LPP instance depended on clear learning outcomes for the LPP and whether or not the LPP was voluntary or mandatory, and whether it was within an organisation or between organisations. At these central practitioners' inter-organisational LPP events, conflict was noticeably absent, not least because these events were voluntary. However, conflict could abound or be absent within a central practitioner's international private school. For instance, the absence of conflict was noted at all the Head of Teaching and Learning Technologies's LPP episodes in his school, not least because attendance at these episodes was voluntary. Ultimately, different organisational contexts result in varying degrees of both participant engagement and disengagement within an organisation, and impact continuity of technological pedagogical expertise in LPP episodes in the organisation.

Community stewardship

Central practitioners supporting LPP in the CoP reflect not only their interests but also the community's interest to support changing teaching and learning practices through technology in schools. Central practitioners demonstrate stewardship of the CoP (Hsu & Sharma, 2008). For example, the ICT Facilitator expressed her desire to support the community:

So this is the flipside. This is my give back to the community. And this is the one side of my job that nobody else does. And I'm very proud of it because you see everyone is like, "Yes, this is what we need." And it also gives me the opportunity to talk about theory to people so it's not just the hands-on stuff.

Individual agency

An important factor to emerge from the data was individuals acting on their own or on behalf of organisations to facilitate LPP. For example, the ICT Facilitator, as the primary strand leader for a conference organised by the Learning Technology Adviser's non-profit organisation, recruited the Head of Teaching and Learning Technologies, the ICT Curriculum Leader and the Learning Technology Coordinator to open their HK international private schools for conference participants from schools and other organisations in the region and to demonstrate each school's technological pedagogical expertise. The Learning Technology Coordinator shares how he was recruited:

In terms of coordinating, it's because of my connection with the ICT Facilitator. Last conference, I ran some whiteboard workshops. The ICT Facilitator was the primary strand leader so I ran whiteboard workshops for her strand. So I volunteered to do that [for this year's conference] but then the ICT Facilitator asked me to help [on the school visits] basically what's happening with the ICT Curriculum Leader and a few other people. So the ICT Facilitator as the strand leader pulled the team together based on people she knew from last time. We work across the road so it's quite easy for us to get in contact if needed.

Similarly, people who were interested in LPP opportunities for themselves and their organisations arranged with central practitioners for initial or subsequent LPP episodes. For example, the Head of Teaching and Learning Technologies's HK international private school is split into a German-language-and-curriculum section, and an English-language and International Baccalaureate (IB) section. In the main, the Head has worked in the English-language, IB section. This includes running educational technology workshops for parents in the English-language, IB section. When asked if parent workshops are open to German parents, the Head replied:

Well it is I suppose, technically. But they're not in the loop. But if one emailed me, there'd be no problem. They could come along. And this raises something interesting because what has happened this year, it's so noticeable, how much more contact I have with German colleagues about technology. And their whole relationship, originally it was clearly different, and I think I'm going soon to have to teach a class of German kids technology. I think I'm going to have to start doing something with that. That would be a huge breakthrough to get into that.

The importance of individual agency in developing legitimate peripheral participation in inter-organisational CoPs for changing practices in schools supports similar findings from Slatter and France (2011). Whether or not people meet by serendipity or by previous arrangement, certain individuals capitalise on such social interaction to create subsequent social interaction among participants at future LPP episodes. This follow-up support is instrumental in successful technology integration in schools (Peeraer & Van Petegem, 2012). Additionally, these individual agents model shared or distributed leadership (Hsu & Sharma, 2008) and drive social capital development (Schweir et al., 2004) not only for their CoP but also for their respective organisations.

Organisational factors

An organisational mission and practice of legitimate peripheral participation

The patterns in Table 1 illustrate the wide range of community members and organisations involved in the CoP's LPP. The central practitioners were able to support LPP episodes with many different community members and in many contexts. The organisations in the CoP were active agents for LPP episodes in mission and in practice. For example, the mission of the non-profit organisation which the Learning Technology Adviser leads is to bring:

[E]ducators from within and beyond the region together to interact with ideas and experiences designed to make them better prepared, informed and enthused to be able to bring out the best in the digital native learners they influence.

In practice, the organisations provide the means for LPP episodes. For example, the Hong Kong university at which the ICT Facilitator and the Head of Teaching and Learning Technologies team-teach provides the course and the classroom where a diverse body of people from mainstream and international schools and other organisations in Hong Kong gather because of a mutual engagement of changing teaching and learning practices through technology in schools. Similarly, the ICT Facilitator shared an example of how Apple arranges for her to support international LPP episodes:

[A person] from Apple called me up and asked if I would join this session [in Shanghai] for them. I was running a workshop for Apple in Shanghai; and [a curriculum leader for a secondary school in Hong Kong] was in the session and her husband who works for [the Learning Technology Adviser's school confederation] contacted me with [that curriculum leader] and asked me if I would run that session at the curriculum leader's school. And on the back of that, they've pulled me to run these sessions here [at the Learning Technology Adviser's school confederation headquarters].

Distinctive roles in organisations for fostering legitimate peripheral participation

The distinctive role of the central practitioners in their schools influenced greatly the continuity and fecundity of LPP episodes in the community, and the great variety of stakeholders and organisations involved in the episodes. The central practitioners were pedagogical support for teaching through technology personnel, and were neither technicians nor teachers in a traditional sense. Since these personnel are not necessarily tied to a content area, a year group or a class, these people can expand their social network more freely in a school and have more opportunities to support the pedagogical aspect of teaching through technology with a greater variety of stakeholders. The ICT Facilitator commented on her unique organisational role:

Partly because within the school we're not harnessed to work with a class so we work, well, I work across the whole school, so therefore, we do have a larger node connection just by way of the fact that we're everywhere.

It is not only schools that have these unique roles. Businesses, universities and professional organisations may also have unique roles for fostering LPP. For example, the ICT Facilitator also works as a part-time university lecturer and as an Apple Distinguished Educator for Apple. Regarding the nature of the latter role, the ICT Facilitator said this to an audience attending a professional development seminar:

Thank you very much. I know I have seen some of you already, and I'm hopefully not going to be repeating what I have talked about. I am very lucky to be an Apple professional developer, which is why I'm here to talk to you. I'm not here to sell products. I'm here to talk to you about what we need to be doing as ICT facilitators and how putting hand held devices or mobile technology into the hands of learners is going to change the game.

Negotiation for and conflict of interest in fostering legitimate peripheral participation

The central practitioners demonstrated a proclivity for outside practice. They were able to work with other organisations such as businesses, universities and professional organisations to support changing practices not only in their schools but other schools as well. These outside practices of supporting LPP in the CoP required constant negotiation and compromise between the central practitioners and their organisations. For example, the principal of the ICT Facilitator's school commented on the ICT Facilitator's outside practice, particularly on behalf of Apple:

Apple will sometimes ask us permission, "Can [The ICT Facilitator] go to an event?" At other times, when schools have asked her specifically, we'll talk about it...we have an agreement that she would have some time to do this...she worked December break so it was compensation time for the time that she had done [other things].

The legitimisation of outside practice and the involvement of multiple organisations in LPP episodes may create agency problems and conflicts of interest. This study echoes Fuller et al.'s (2005) findings that:

[T]he control and organization of work will affect employees' opportunities to learn. Those with control over such resources can exert their power to create or remove barriers and boundaries which facilitate or inhibit participation. (p. 66)

For example, the Learning Technology Adviser works for a school confederation and also has founded and directs an education non-profit organisation which hosts regional education conferences. In this way, the Adviser can provide LPP opportunities to people in his Hong Kong school confederation. However, a line had been drawn recently at the Adviser using the school confederation's budget to support people from the confederation joining one of the Adviser's conferences. When a teacher from the Adviser's school confederation asked the Adviser if signing up for a conference cost anything, the Adviser replied:

I'm afraid it does. I was allowed to support schools [in the confederation] using my budget but then I got told because I'm involved in running the event, they fear there is a conflict of interest, so it would be best if I hadn't been involved, ironically, so unfortunately, you will all have to pay.

Discussion

The inter-organisational CoP in this study may point a way towards an emergent model of changing schools' technological pedagogical practices through LPP. Both central and marginal practitioners receive continuous professional development through LPP episodes, and central practitioners cultivate the CoP and can demonstrate a great degree of individual agency. For schools, the value of this inter-organisational CoP is the involvement of diverse body of organisations in the LPP episodes for changing teaching and learning practices. More organisations may create more LPP episodes for the CoP. The involvement of multiple organisations also connects a greater variety of people in LPP episodes. Central practitioners have unique roles in their schools that provide central practitioners great room to network within and beyond the school organisation. This influences the fecundity and variety of LPP episodes in the CoP. The findings support what Fuller et al. (2005) have recognised as the importance of a CoP engaging beyond the boundaries of a workplace. They also reflect similar findings from Slatter and France's study (2011), where the benefits of partnering with industry in integrating technology in schools through CoPS were observed.

While this study is based on educators in organisations within the context of Hong Kong, the findings can still be of interest and significant in wider educational contexts. They can also be instructive for LPP in CoPs without a technology integration focus. The engagement of multiple organisations in LPP represents a great number of corporate and individual approaches and perspectives (Hsu & Sharma, 2008). For CoPs with a technology integration focus, this may produce a wider range of considerations and solutions for supporting changing teaching and learning practices through technology in schools. Therefore a CoP confined to an organisation such as a school could benefit greatly from partnership and meeting with other schools, professional organisations and businesses.

The central practitioners in this study reached more people within and between organisations for LPP when their organisations did not rigidly tether these practitioners to certain cognate groups, or to the organisations themselves. Organisations such as schools that tend to have stringent roles and organisational units with stringent membership could consider more amorphous roles and porous organisational units in view of changing teaching and learning practices through technology. Ultimately, stringent roles and organisational unit membership may limit who people can meet and with whom people can construct knowledge within and between organisations.

Individuals, organisations and nations where technology integration knowledge and practice is very limited may also benefit from LPP in an inter-organisational, international CoP. The findings may be especially important for any institution facing severe limits and constraints to supporting its members' professional development and knowledge building. Institutional support and additional individual engagement are critical for changing teaching and learning practices through technology. At institutional levels in Vietnam (Peeraer & Van Petegem, 2012) and Cambodia (Dionys, 2012), for example, limited institutional support and limited human resources significantly impact teacher professional development for changing technologies and pedagogies. Inter-organisational CoPs are a flexible response to an institution's needs since they outsource the training and retention of human resources so that an individual institution does not bear the total cost for capacity building. For an inter-organisational CoP with a technology integration focus, LPP plays a role in ICT skills training not at an organisational level, but inter-organisational level.

This study illustrates the possibility of increasing conflict within and between organisations because of competing individual and corporate beliefs, values and assumptions. Unequal power relations and conflict were present between individual agency and organisations' interests. In other research on CoPs for changing teaching and learning practices through technology, Schwier et al. (2004) have commented on the disrespect and ambiguity shown to instructional designers and their informal CoP by their organisations. The value and relevance of LPP in a CoP for changing practices is not only the identification of conflicting individual and corporate beliefs, values and assumptions, but also the opportunity to reconcile these differences. The ongoing value and relevance of LPP may be the extent to which individuals and organisations can negotiate and address conflict well. In the same way, unequal power relations exist between organisations: for instance business rivals Apple and Google have made inroads in the community and seek to influence the type of technological pedagogical expertise being developed in LPP.

For fostering LPP, individuals and organisations should identify where unequal power relations are manifested and how they impact people's opportunities to learn. For example, how much power should a business wield over a school, individuals in that school, and more generally, in a CoP for changing practices? Fuller et al. (2005) have suggested that organisations which control resources for the community may have greater influence over participation in the CoP. An area for further research is the extent of unequal power relations between organisations involved in a CoP for technology integration. In the same vein, the locus of control in the development of LPP episodes is an area of further research. For example, there could be a tendency for either central practitioners or marginal members to arrange the logistics and details of LPP episodes for changing practices.

While this study captured the continuity and change of LPP episodes in a CoP through select central practitioners, the study did not capture the continuity for all the community members at the LPP episodes. Temporal and workload constraints limit understanding of the degree to which all members further initiate and familiarise themselves with the CoP and to what extent members have further acquired and applied the new technological pedagogical skills and information from their LPP. This study's case methods also emphasise depth over breadth for which reason the study focused on select central practitioners in the CoP and relied on them for data on marginal practitioners and LPP episodes. Data from these central practitioners cannot capture the totality of LPP episodes. Furthermore, there may be more instances of LPP episodes mentioned during observations and interviews but those cannot be validated as well as those episodes which this researcher observed. Similarly, while online data sources such as Twitter feeds were collected to triangulate data from LPP episodes and interviews, for instance, as components of blended learning with LPP episodes, they were not examined as sources of new, face-to-face LPP episodes or platforms for LPP episodes. Ultimately, the case study approach is highly

contextualised and cultural, and while analytical generalisations arising from studying LPP with central practitioners in this CoP can be applicable to other contexts of LPP in CoPs, researchers and practitioners must always consider variation in both application and outcome.

To conclude, as new technologies continue to shape society and schooling, inter-organisational CoPs may play a greater role in bringing together different education stakeholders, organisations and ideas for technological pedagogical change in schools. This study begins the process of identifying types of individual and organisational factors, and more generally, educational contexts where inter-organisational CoPs impact schools. Broader research on LPP in CoPs and research in different educational, organisational and national contexts will reveal more discreet qualities to aid the policy and practice of supporting central practitioners and scaling LPP in a CoP for changing practices in changing schools.

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