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Peer Apprenticeship Learning in Networked Learning Communities: The Diffusion of Epistemic Learning

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This article discusses peer apprenticeship learning (PAL) as situated within networked learning communities (NLCs). The context revolves around the diffusion of technologically-mediated learning in Singapore schools, where teachers begin to implement inquiry-oriented learning, consistent with 21st century learning, among students. As these schools have in past practices excelled in performance-driven pedagogies suitable for passing examinations, redesigning curricular resources, assessment, and pedagogical practices towards inquiry-based learning was not insignificant. These teachers required convincing and also significant degrees of apprenticeship. The authors document PAL in action for teachers' epistemic change occurring within networks of teachers from across schools. The article delves into PAL processes, expanding the theory (see Hung,

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1999) beyond students to teachers and beyond dyad pairs to communities of teachers. Through PAL situated in NLCs, the article argues that epistemic learning can be diffused across schools, and is an appropriate scaling mechanism, seeing that teacher capacity to enact 21st century learning is key.

Introduction

Networked learning communities (NLCs) are teachers coming together from across schools to engage in intentional and purposeful professional learning. Such phenomena are evident in the Singapore education system (Hung et al., 2016). Through these networks, teachers form inter-relationships and collaborations among members, with the goal of improved student outcomes.

From the perspective of the diffusion of innovation, facilitated by the NLCs as a key driver, the innovations impact deeply upon the formal curriculum, in line with the educational philosophy of the particular innovation (Hung, 2014). The innovations are also first carried out with some degree of scale within the innovating school before it has sufficient experience in diffusing to other schools. There has to be the cultivation of teacher leaders who champion the innovation and subsequently enable with the facilitating norms to spread it to other teachers. The Ministry of Education's (MOE) policy calls for NLCs to be formed and for Lead Teachers (a career track for teachers who progress from beginning to senior, and to lead teachers, and ultimately to become master teachers) to rove around other schools facilitating for diffusion.

Concomitantly, in order for the innovation relating to formal curriculum—where exam performance is of high stakes—to spread to other schools, it has been found that significant degrees of expert-teachers *apprenticing* novice-teachers are needed. Across-school leadership is also vital as it creates partnerships and other structural supports and resources that cultivate experimentation by teachers. These resources include teacher-mentors tasked to apprentice teachers from other diffusion schools to be shared. Careful planning at the cluster level of schools is also needed to accurately select the schools who are the early adopters. In other words, the NLCs in the process of diffusion require teachers to not just come together to professionally dialogue, but there is also the dialectical process of dialogue and enactment of lessons, accompanied by a peer (teacher-to-teacher) apprenticing structure and process.

Epistemic change has been observed in teachers who underwent these NLCs. Example protocols of such change include "...the classroom environment is different...it is noisy. My students are asking questions...My role as teacher changes...I can say I don't know and encourage students to find out..."; and "it is OK if I cannot answer the students' questions—

students direct the learning." Since epistemology is the study of our method of acquiring knowledge, epistemic learning is the process through which 'how we come to know' is *changed*. In particular, we hope to change teachers' beliefs that knowledge comes from an authority to the belief that knowledge comes through reason and empirical evidence and inquiry. Our working hypothesis is that if teachers change their epistemic understanding of knowledge, they would in tandem change their pedagogical stances in the classroom towards inquiry.

This epistemic change process occurs within the context of the school and education system, which has to account to parents and other stakeholders for maintaining reasonably successful performances in the required high-stakes examination. One school leader expressed this need as: "experimenting with boundaries...Teachers need to change the ways they teach and yet meet curriculum objectives...". Curriculum objectives here means the requirement to complete the syllabus and to satisfy the year-end requirements for students to be promoted to the next grade levels. As such, the expectation for teachers is on the one hand to deliver performance results in semester exams, yet on the other hand to translate their learning goals in NLCs to the enactments of new curriculum ideals.

Due to the need to 'change the car wheels while the car is still in motion' (metaphorically), we found the need for teachers to be apprentices; otherwise, it would be too easy to default to tried-and-tested approaches. A more experienced teacher (mentor) and a less experienced teacher (apprentice) will take turns to co-teaching a class after agreements are made in the NLCs. After in-class enactments, these mentors and mentee apprentices relate their experiences back to their respective NLC.

Peer Apprenticeship Learning

...I think for me, before I could move into being very open about listening to other people...I find that it's [I come to] an acceptance. Because it's different from tolerance. You tolerate...every week, you come and you tolerate. You are not taking joy in it. You will not want to participate in it but once you accept it...it's part of learning as a teacher. And you have to look at it as my students' benefit. It's not just me. But, if I don't translate all this information or share it with my students, my students do not have the chance. So, why should I be a blocked vessel? I would rather take in whatever is good. Of course, I could make my own judgment and then if it is applicable to my class and it benefits them, then why not. Taking joy in acceptance... (Teacher involved in a NLC)

The above quotation illustrates an interesting phenomenon. A teacher was assigned to join in one of the NLCs and was 'unwilling.' She tolerated coming, although the starting point was deference to authority, and as such she submitted. The teacher later went from tolerating to accepting, and

finally to 'taking joy in acceptance.' The transformational journey by this teacher is consistent with the theory of peer apprenticeship learning (Hung, 1999).

Consistent with Hung (1999), in the stages of peer apprenticeship learning in the case studies documented (for details of these studies see Toh *et al.*, 2014) we have observed the following phases:

(1) *Initiating phase*
  a. Goal of the network was established in order to co-design lessons for enactment.
  b. Detailed explanation—*by core members (i.e., teacher leaders* from the nodal school)— about the goal; these were preplanned by the core members of the network.
  c. Potential challenges brought by the participants, indicating dissatisfaction about the goal. Issues about parents, homework, and others were appearing—*by NLC members.*
(2) *Tolerating phase*
  a. Orchestrating for common goals among the network members—*facilitated by core members of the NLC.*
  b. Peer scaffolding demonstrated by the members (incrementally)—division of lesson plan into several topics and spearheaded by smaller groups, *promoting ownership and accountability.*
  c. Collective discourse to share experiences in refining actions towards the goal—*by members and facilitated by core.*
(3) *Accepting phase*
  a. Initial indication of epistemic learning—member(s) willingly offered suggestions from personal experience to improve on the lesson plan.
  b. Display confidence that the goal may actually work.
  c. Ability to address challenges brought up— *stories by members on how they overcame the challenges enacted.*
  d. Discourse more focused on refining lesson plan—*rather than complain and challenge.*
  e. Signs of enthusiasm in reenacting the "refined" lesson plan—mentee's class observations and post-discussion seeking inputs from mentor.

More generally, these three phases can be connoted as acquisition, participation, and transformation, respectively. Based on our observations, the span or duration from acquisition to transformation could be approximately a year.

Expanding on Hung's (1999) framework and situating it according to the diffusion context, see *Table 1*. The *italics* terms reflect the extension from Hung's original work.

Hung's (1999) theory of epistemic learning through apprenticeship connotes initial suspending of one's own beliefs after numerous occasions of struggling by the novice-learner. The learner begins to accept the need to

Table 1. Peer Apprenticeship Learning processes applied to the diffusion context.

Mentor's Regulatory Actions	Learner's Regulatory Actions	Learner Changes	Epistemic Learning Stages
Orches-trating	Tolerating/ Submitting	Beliefs	Acquisition
Modeling	Accepting/ Mirroring	Actions	Participation
Coaching	Constructing/ Reflecting	Beliefs and Actions	Transfor-mation
Fading out	*Enjoying/ Spreading*	*Beliefs, Actions, Identity*	*Diffusion*

'learn' through mirroring of the expert's skills, and subsequently undergoes attempts at constructing the desired skills and behaviors. Consistent with Michael Polanyi's notion of personal knowledge, Hung (1999) posited that not only are overt skills assimilated through apprenticeship, but also tacit knowledge is subconsciously transferred. Transference here is not described as a role or mechanistic assimilation but one which is appropriated to being one's own. Such an appropriation is consistent with social-cultural notions. When one belief is influenced by the new practice, indications such as "I enjoy sharing with other teachers" becomes evident.

Scalable Epistemic Learning

The scalable epistemic learning framework (see *Figure 1*) considers the system leverages of Singapore's education system. In particular, the Academy of Teachers (AST) of the MOE initiates NLCs where Master Teachers from throughout the system congregate and lead networks of teachers within their disciplinary orientations. Interviews with these Master Teachers suggest that they desire to foster a teacher led culture of professional learning and lead the Senior and Lead teachers in the system. Consistent with observations from our research-based interventions, AST's NLCs are also a combination of teacher dialogues with actual enactments in classrooms after trust is built among the NLC members— they co-observe each other's lessons. While AST initiates these system-led NLCs (at the Macro layer of the system), there are numerous networks formed at the cluster of schools' level (Meso layer of the system), such as our diffusion efforts by interventions carried out by researchers in partnership with schools. We refer to
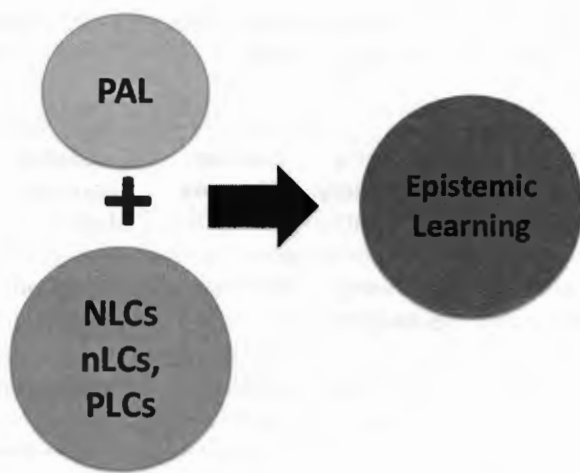
Figure 1. Scalable epistemic learning.

these networks as nLCs to differentiate from system-led ones. Concomitantly, there are also professional learning communities (PLCs) in schools centered around the respective disciplinary departments (micro layer of the system).

Importantly, these networks already exist at all three layers/levels of the education system, creating the social-infrastructure for teacher professional dialogue for the purposes of spreading practices. What is of imperative need is for teachers' epistemic change to be well aligned and coordinated among the various initiatives by AST, clusters, and schools. The deployment of mentors and mentees would also need to be tightly coordinated. Within the proximal handholding of mentors and mentees, and the subsequent teacher leadership arising from mentees, there would be a natural succession planning process for innovation diffusion and expertise transference. With Peer Apprenticeship Learning as an integral part of NLCs, nLCs, and PLCs, epistemic learning can be diffused and hence scalable. Moreover, with the importance placed by the MOE to encourage teachers to engage in such professional learning within and across schools, it sends a clear signal for schools to engage in change within an innovation-21st century learning ethos.

We have also designed emergent goals of teachers. Ownership is obviously more forthcoming if learning needs "emerge" from teachers themselves. When they voluntarily join NLCs, nLCs, or PLCs it would seem to foster dialogue. These would be characterized as "designed" goals as initiated by previously established interventions, where the proof of concept (PoC) of a particular innovation has already been validated. In other words, research has already validated the efficacy of the intervention, and we hope to bring teachers into the learning experience, albeit in ways that might not have been initiated by the teachers' own volitions.

However, we recognize that through peer apprenticeship learning and good facilitation, there could be the possibility of bringing ownership to teachers, and the subsequent change through epistemic learning. Such positive experiences of teachers have been documented (see Hung, 2014), and which we posit to be scalable.

Conclusion

The problem of scaling in education is well documented in the extant literature (see Hung, Lee, & Wu, 2015; Lee, Hung, & Teh, 2015). While curricular resources can be 'rolled out' throughout a system to schools and teachers, the curricular products do not typically situate themselves into the instructional and pedagogical practices of teachers' everyday lives, unless there are intentional processes to do so.

Structures and processes, including the much needed time and culture needed for teachers to dialogue around curricular goals to the benefit of students' learning, are central to the scaling intent. Instead of 'scaling,' we have adopted the term 'diffusion,' which hopefully connotes the bottom–up diffusion and take-up of particular curricular goals with the teacher at the heart of the intent.

While resources would certainly help in the reform efforts, more importantly, teachers need to appropriate and own the efforts. Peer apprenticeship learning is espoused to aid teachers in a transitional shift, especially with respect to epistemic beliefs. PAL is central to the reform agenda, especially if the present cultural milieu is distant from the envisaged agenda. PAL provides a scaffolding process for teachers to be apprenticed towards the desired outcomes. ☐

References

Hung, D. (1999). Activity, apprenticeship, and epistemological appropriation: Implications from the writings of Michael Polanyi. *Educational Psychologist, 34*(4), 193–205.

Hung, D. (2014). *A systemic view to scaling: Centralization and decentralization balances.* A report to Ministry of Education. Singapore: Edulab, MOE.

Hung, D., Lee, S. S., Toh, Y., Wu, L. K., & Jamaludin, A. (2016, in press). *Innovations in educational change: Cultivating ecologies for schools.* Singapore: Springer.

Hung, D., Lee, S. S., & Wu, L. K. (2015). Towards an educational view of scaling: Sufficing standard and not a gold standard. *Educational Research for Policy and Practice, 14*(1), 77–91.

Lee, S. S., Hung, D., & Teh, L. W. (2015). An ecological view of conceptualizing change in the Singapore education system. *Education Research for Policy and Practice, 15*(1), 55–70.

Toh, Y., Jamaludin, A., Hung, D., & Chua, P. (2014). Ecological leadership: Going beyond system leadership for diffusing school-based innovations in the crucible of change for 21st century learning. *The Asia-Pacific Education Researcher, 23*(4), 835–850.