Learning as boundary-crossing in school–university partnership ☆

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Abstract

This paper points out that globalization has raised fundamental questions about knowing and learning and that it is essential for educators to engage in collective knowledge generation by crossing community boundaries. Drawing on the theoretical framework of Activity Theory, this paper reports on a study on the expansive learning that was afforded by a school–university partnership as university tutors, mentor teachers and student teachers engaged in a new activity system mediated by lesson study. The study showed that in the course of resolving contradictions that were inherent in the boundary zone, they negotiated the mediating tool and consequently, the activity system was transformed from helping student teachers learn to teach into learning for all participants. This paper concludes that it is essential for teachers and teacher educators to develop the capability to engage in expansive learning through tackling ill-defined problems in boundary zones.
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1. Introduction

The intensity, immediacy and simultaneity of information transmission and knowledge generation brought about by globalization have raised fundamental questions about what knowing means and what learning entails. We are constantly learning something ahead of time that is ill-defined or poorly understood; as soon as a new set of solutions is proposed, a new set of problems, often inherent in the solutions, arises (Engeström, 2001). The interconnectivity brought about by globalization has blurred, expanded and penetrated traditional boundaries, geopolitically, socially and culturally (Albrow, 1990; Giddens, 1990, 2000). It is no longer sufficient for an individual to acquire expertise within the boundary of one's own discipline or profession nor is it possible for one to know everything, even in one's own field of expertise. Knowing, as Wenger (1998) observes, is a living process in which knowledge is generated in the course of acting, thinking and conversing with fellow practitioners. One has to engage with members of other communities of practice; one

has to move between multiple parallel contexts. These contexts demand and afford different, and sometimes conflicting, mediating tools and patterns of social interaction (Tuomi-Gröhn, Engeström, & Young, 2003). One is challenged to negotiate and integrate elements from different contexts to provide solutions to problems. Experts, as Engeström, Engeström, and Kärkkäinen (1995) point out, not only engage in multi-tasking within the same activity system or community of practice, but also operate in multiple communities of practice (see also Tsui, 2003). They typically integrate elements in multiple contexts in providing solutions.[1] This new landscape of expertise has been characterized as "polycontextuality" and "boundary-crossing" (see Tuomi-Gröhn et al., 2003).

2. Boundary-crossing and learning in boundary zones

Boundaries are often seen as sources of potential difficulties. However, they also afford opportunities for innovation and renewal. Crossing boundaries forces participants to take a fresh look at their long-standing practices and assumptions, and can be a source of deep learning. Wenger, McDermott, and Snyder (2002) observe that "While the core of a practice is a locus of expertise, radically new insights and developments often arise at the boundaries between communities" (p. 153).

The term "boundary zone" has been proposed to describe a place where elements from both activity systems are present (Konkola, 2001, cited in Tuomi-Gröhn et al., 2003). The concept of "the third space" has been proposed alternatively to describe the learning that takes place when ideas from different cultures meet and form new meanings (Gutiérrez, Baquedano-López, & Tejeda, 1999). A boundary zone is polycontextual, multi-voiced and multi-scripted. As such, it is characterized by alternative or competing discourses and positionings which afford opportunities for the transformation of conflicts and tensions into rich zones of learning. Very often, in the course of resolving contradictions, a more encompassing object or motive for the activity is constructed, resulting in a transformed activity system. Engeström (2001)

refers to the kind of learning that takes place in this process as "expansive learning" (p. 137). Expansive learning, according to him, is typically triggered by existing practices being questioned rather than by a given learning task (see also Engeström, 1999).

Boundary-crossing involves going into unfamiliar territories and requires cognitive retooling. New elements are introduced from one community of practice to another via boundary crossers, or "brokers" (Wenger, 1998). These elements, referred to as "boundary objects" (Star, 1989), often lead to the creation of new tools. As Engeström et al. (1995) point out, technological innovations and new product developments typically involve horizontal boundary-crossing and sustained boundary interactions (see also Wenger et al., 2002). In some cases, the introduction and creation of new boundary objects can lead to profound changes in the activity system. Therefore, we need to engage in learning which develops our capability to cross boundaries, negotiate the object of an activity system (even when it is ill-defined), and resolve contradictions with members of multiple communities of practice.

Drawing on the framework of Activity Theory and the concept of "boundary-crossing" proposed by both Engeström and Wenger, this paper reports on a study of "boundary-crossing" in a school–university partnership. It examines the learning that took place as participants, that is, mentor teachers (MTs), university teachers (UTs) and student teachers (STs) crossed community boundaries and engaged in the joint enterprise of teaching and learning mediated by lesson study as a boundary object. It discusses the contradictions in the boundary zone, and how in the course of resolving these contradictions, the boundary object was negotiated, resulting in a transformed activity system of learning for all participants.

3. Activity Theory

Before we report on the study, it may be helpful to outline briefly the basic tenets of Activity Theory. The concept of "activity" as mediating between the individual and the social dimensions of human development originated from Vygotsky's proposal of human action mediated by psychological tools as a unit of analysis of the individual's higher cognitive processes (Vygotsky, 1978). It was further developed by his followers, Leont'ev and Luria, who proposed that individual or group actions are embedded in activity systems which are collective

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[1]Engeström et al. (1995) Engeström, Engeström, and Kärkkäinen (1995) have argued for a broader, multi-dimensional view of expertise, which they refer to as a "horizontal" as opposed to a "vertical" view that focuses on stages of knowledge development and levels of skill.

and social in nature, and must be understood accordingly. Hence, they expanded the unit of analysis from human action to activity system and their work has come to be known as Activity Theory (see Leont'ev, 1981; Luria, 1974).

Activity Theory sees an activity system as being directed by a motive. According to Leont'ev (1981), the motive of an activity is its object. The object distinguishes one activity from another, although individual participants may or may not be fully conscious of it. Activities are realized by goal-directed actions that are subordinated to motives. An action must be understood in the context of the motive of the collective activity system. In Leont'ev's well-known example of the primeval collective hunt, the individual action of the beater to frighten the animals appears senseless and unjustified unless it is seen as part of the activity driven by the motive of obtaining food. The same action may accomplish different activities and may transfer from one activity to another; the same activity may be realized by different actions. For example, the same action of frightening animals away could be driven by the motive of protecting children, and the same activity of obtaining food may be accomplished by growing food crops. The achievement of goals involves an individual participant or multiple participants (i.e., *subject(s)*) and is mediated by psychological tools (i.e., *mediational tools*) (Leont'ev, 1981). The subject, the object and the mediating tools that make up the top half of the triangles in Fig. 1 constitute the observable part of an activity system.

Activity Theory has been further developed by Engeström (1987) who proposed three more com-

ponents of an activity system. First, as all activity systems are collective, the *communities* in which they are embedded form the social basis of these systems. The relation between subjects and community are mediated by *rules*, that is, the norms, conventions, expectations, and social relations within the community which are historical and cultural. The *division of labor*, that is, the explicit and implicit organization of the community, mediates the transformation of the object of the activity system into the outcome. In other words, rules and the division of labor define how participants are expected to behave and who is expected to do what in the achievement of the object of an activity system. These three components are represented in the lower half of the triangle in Fig. 1 and they constitute the unobservable part of an activity system.

The concepts of "activities" and "activity systems" (referred to as "activity settings" by some, see Tharp, 1993) have been used increasingly as a means of investigating the context of learning. Activities are seen as embedded in activity systems. For example, the activity of learning vocabulary is embedded in the activity system of classroom learning, and the activity of an inter-class speech contest is embedded in the activity system of a school. Activity systems can also be embedded in one another. A classroom can be an activity system and several activity systems can be embedded in a classroom, for example, group work and whole-class teaching. It is in these activity systems that participants engage in common social processes through which meanings are developed and cultural life is propagated.

Activity Theory maintains that in the process of engaging in an activity, the motive of the activity is reconceptualized, and new forms of activity as well as culturally new patterns of activity are created. Central to this transformational process of expansive learning is the role of contradictions, inherent within and between activity systems, as sources of change and innovation (Il'enkov, 1977). In what Engeström (2001) refers to as the "third generation" of activity theory (p. 135), two interacting activity systems have been taken as a minimal unit of analysis. The concept of "boundary crossing" (Engeström et al., 1995) has been developed to help understand the interaction between these activity systems, the multiple perspectives and the "multi-voicedness" (Engeström, 2001, p. 133) inherent in these systems. As contradictions in the boundary
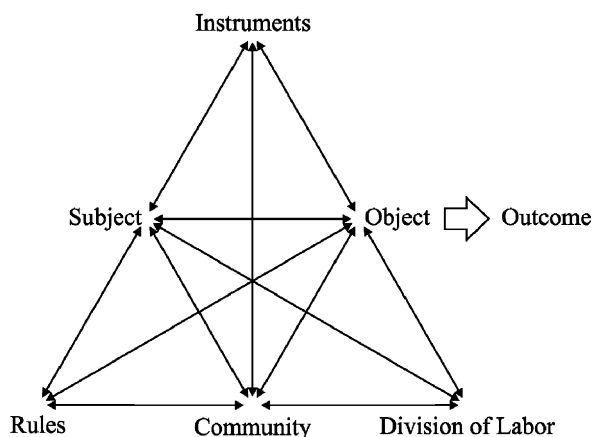

Fig. 1. Components of an Activity System (Engeström, 1987).

zone are resolved by new mediating tools or new activity systems, new contradictions are simultaneously generated. It is through the continual resolution of contradictions that new forms of knowledge are generated.

4. Boundary-crossing in school–university partnership

At the University of Hong Kong, the interaction of the activity systems of mentoring STs by MTs and supervising STs by UTs was facilitated by a school–university partnership that was set up 10 years ago. The initial conception was pragmatic and based largely on a quid-pro-quo *modus operandi*: experienced teachers were invited to act as mentors to STs placed in their schools during the teaching practicum. The UTs, in return, provided advice and assistance to schools regarding pedagogy, curriculum design, and staff development. Over the years, through the mutual engagement of UTs, school principals and MTs, the object of partnership as an activity system was transformed. It has been reconceptualized the unified professional development of teachers that begins at the teacher preparation stage and continues in a seamless fashion throughout teachers' careers (Tsui & Wong, 2006; see also Tsui, Edwards, & Lopez-Real, forthcoming). This transformation was brought about by various forms of mutual engagement which required participants to cross community boundaries when they engaged in a new activity system (see Tsui, Lopez-Real, Law, Tang, & Shum, 2001).

4.1. Research questions

In the study reported in this paper, we focused specifically on one form of mutual engagement, the guidance provided to STs in classroom teaching. We report on how in the boundary zone made available by school–university partnership, a boundary object brokered by UTs, "lesson study', was adopted as the mediating tool. The research questions that we tried to address were firstly, how "lesson study" mediated the object of the new activity system of enhancing STs' learning and what contradictions were generated; and secondly, how these contradictions were resolved and what kind of learning took place.

The data collected in this case study consisted of recordings of two collective lesson-planning conferences, four lessons taught by the STs over 4 weeks,

four post-observation conferences, and a total of five interviews (two with MTs, two with STs and one with UTs). These conferences and interviews were transcribed and analyzed.

4.2. Activity systems of mentoring and practicum supervision

According to the Activity Theory framework outlined above, the mentoring of STs by MTs and the supervision of STs by UTs are two different activity systems which can be represented by the two triangles in Fig. 2.

The left triangle represents the activity system of mentoring and the right triangle represents the activity system of supervising.[2] In the activity system of MTs mentoring STs in school settings, the object is primarily to ensure that STs are able to teach competently, to cover the curriculum content adequately so that MTs do not have to "clean up the mess" when they resume teaching their own classes (Roth & Tobin, 2002). Helping STs learn to teach is often relegated to secondary importance. We could say that the former is the "*primary object*" whereas the latter is the "*secondary object*" (see Obj 1a in Fig. 2). The activity of mentoring is mediated by lesson observations of STs by MTs, conferences with STs, curriculum materials, and so on. The *rules*, that is, the norms, expectations and perceptions of the school community are historical and cultural. They shape the way supervision of STs is carried out by MTs which in turn shapes the way STs respond to the supervision. STs are expected to behave according to the norms and conventions of the school community in which they are placed. The *division of labor* in the achievement of the object of helping students learn consists of the STs enacting the lesson and the MTs providing guidance in pedagogy.

In the activity system of the practicum supervision of STs by UTs, the *primary object*, in most cases, is to help STs to relate theory to practice in the classroom. Student learning can, in some circumstances, be relegated to a *secondary object* of the activity (Obj 1b in Fig. 2). For example, in some cases, a UT may focus more on the ST's

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[2]Mentoring STs often involve supervising classroom teaching as well. In the context of the reported study, the two terms "mentoring" and "supervising" are used to differentiate the guidance provided by MTs in the former which was formative in nature, and that provided by UTs in the latter which involved summative evaluation.
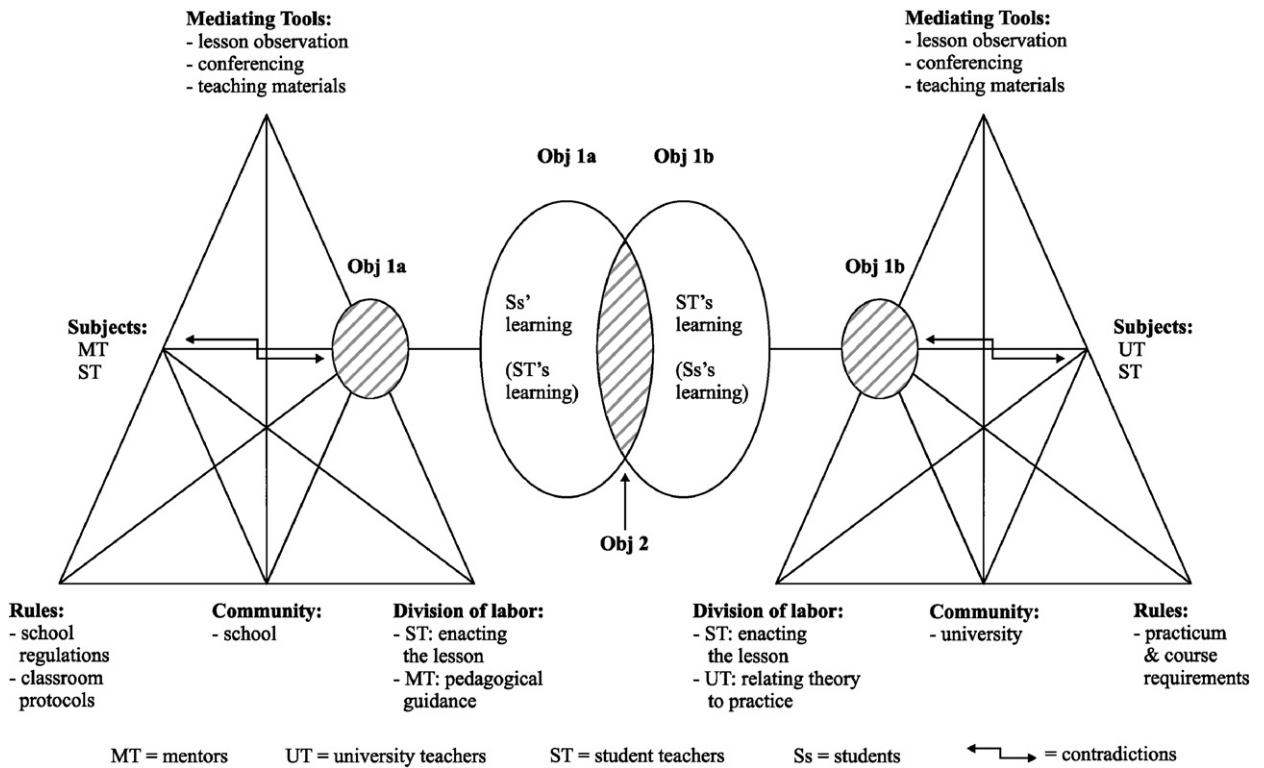
Fig. 2. Boundary-crossing in school-university partnership.

attempt to try out a new pedagogical approach than on its effect on student learning. STs might be evaluated highly by UTs for such an attempt even if the lesson did not work out well. The activity of supervision is also mediated by UTs conducting lesson observations and post-observation conferences. STs are expected to comply with practicum requirements laid down by the university program director, for example, the preparation of lesson plans with clearly outlined objectives, learning outcomes and pedagogical procedures. The achievement of the object of STs' learning is achieved by UTs providing feedback on classroom practices, relating theory to practice, and STs enacting the lesson. Although in both systems the goal-directed actions of the STs are the same, they are subordinated to different motives. One is to ensure that their pedagogical practices conform to the MTs' expectations and the other is to conform to the UTs' expectations. Hence, they realize two different activities.

From the above analysis, we can see that when the two activity systems interact through the STs' participation in both activity systems simultaneously, the multiple perspectives and multi-voicedness inherent in the interaction generate contradictions. STs need to operate in two different systems with two different, though related, objects. One could say that they operate in a hybrid activity system with a janus-faced object: their own learning when UTs are the subjects and students' learning when MTs are the subjects. Therefore, they find ways to "work around" these contradictions by adapting to the activity systems. STs may behave like "chameleons" and change their teaching styles and methods according to whether they are observed by MTs or UTs. This has been a source of frustration and anxiety for STs.

When MTs and UTs collaborate to offer advice to STs on classroom teaching, a boundary zone is created as they cross community boundaries (Obj 2) and they are engaged in a new activity system in which the object contains an inherent contradiction of having both the STs' learning and students' learning as the foci. The contradictions generated by the interaction of two different activity systems have been viewed as problematic. However, as we shall see in the study reported in this paper, it is precisely these contradictions which provide affordances for pedagogical innovation and renewal.

4.3. Lesson study as a boundary object

How to jointly advise STs on classroom teaching has been one of the main concerns of both the partnership schools and the University since the partnership was established. UTs and MTs have conducted lesson observations of STs and post-observation conferences with STs together. Studies on the processes and the dynamics of the interaction in tripartite conferencing have been conducted (see Tsui et al., 2001; Tsui et al., forthcoming). In the case study reported in this paper, MTs and UTs shared the concern of how best to resolve the tension between helping STs learn in a supportive manner and enhancing student learning. In order to resolve the contradictions, one of the UTs introduced "lesson study" as a mediating tool in the new activity system which was subsequently agreed upon by the participants as having the potential of addressing the tension. A brief outline of "lesson study" is presented below.

"Lesson study" is an established practice adopted by teacher-led professional development groups in Japan and China. The term "lesson study" was derived from the Japanese word *jugyo kenkyuu* and coined by Yoshida (1999). In China, the term "lesson research" is commonly used. Lesson study is a systematic investigation of classroom pedagogy conducted collectively by a group of teachers rather than by individuals, with the aim of improving the quality of teaching and learning. The investigation is conducted by examining a series of lessons. The lessons are collectively crafted by teachers, focus on a particular content, explore alternative approaches to the content, and address a particular weakness in student learning or a particular teaching difficulty faced by teachers. The collectively planned lesson is conducted by a teacher, and is also observed and reflected on by the whole group. On the basis of the group's comments, the lesson will be revised, re-taught and reflected on again before a polished lesson is shared outside the team (see Stigler & Hiebert, 1999; Yoshida, 1999). The polished lesson, as Campbell (2003) points out, is only a by-product of the reflective process. The impact of the process goes well beyond the lesson itself; it includes a deeper understanding of content knowledge and how students learn, as well as improved pedagogical skills. As the term "lesson study" suggests, the focus of the investigation is the "lesson" and not the individual teacher. As such, this takes the pressure off individual teachers and encourages free and open discussions about the lessons.

Lesson study, as both a pedagogical practice and a tool for professional development, has drawn the attention of educational researchers because of the consistently outstanding achievement of Japanese and Chinese students, particularly in mathematics (Fernandez & Yoshida, 2004; Linn, Lewis, Tsuchida, & Songer, 2000; Stigler & Hiebert, 1999). Attempts have been made to replicate lesson studies in the United States (see for example, Campbell, 2003; Lewis, 2002; Wagner, 2003). At the University of Hong Kong, staff members have been conducting lesson studies with school teachers, investigating various aspects of student learning (see the studies reported in Marton et al., 2004). It has become an artifact in UTs' community of practice. In the study reported in this paper, the lesson study involved not only practicing teachers, but also STs. The lesson study team consisted of two STs majoring in Chinese language and literature, Chung and Si; two mentors (MTs), Teacher Lo and Teacher Wong,[3] both experienced teachers in a partnership school; and two UTs, Yan King and Angela. Yan King was an experienced teacher educator and Angela was a former Chinese teacher who had been working at the University for a year when the study started.

Yan King was familiar with the research literature on lesson study. She had adopted lesson study for investigating aspects of learning with MTs in partnership schools, but not with STs. Teacher Lo had been involved in lesson studies with peers but not STs. The rest of team was new to lesson study. When Yan King introduced lesson study to MTs and STs, she emphasized the collective responsibility for student learning and the non-personal and non-evaluative nature of the activity. She hoped that by adopting lesson study as a mediating tool, the focus of the activity would shift from the evaluation of an individual ST's performance in the classroom to student learning and pedagogy, since lesson plans, teaching materials and pedagogical strategies would be owned by the team. Moreover, the STs would be researchers in their own classrooms rather than objects of research (Wang-Iverson & Yoshida, 2005).

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[3]In the Chinese culture, "Teacher" is used as the title in the form of address of teachers. Teachers of Chinese language and literature often use this formal form of address even when they address their peers in schools and universities.

5. The lesson study

The lesson study lasted 4 weeks and consisted of two cycles. The team met six times, including two pre-observation conferences and four lesson observations which were immediately followed by post-observation conferences. The lessons covered a lengthy piece of text on Chinese art and the underlying schools of thought. The first cycle started with two collective lesson planning conferences, followed by more detailed lesson planning meetings between the two MT–ST pairs. Teacher Lo was the personal mentor for Si and Teacher Wong for Chung. Chung taught the planned lesson first and was observed by the rest of the team. This was followed by post-observation conferencing. During the conference, comments and suggestions for improvement were provided. The lesson plan and teaching materials were subsequently revised by both STs and then taught by Si, observed by the team, and again followed by post-observation conferencing.

The first cycle failed to achieve the intended outcome. At the end of the first cycle, the team shared their views about the experience. The STs found the experience stressful and unrewarding, especially Si. The re-taught lesson conducted by Si was unsatisfactory and drew a great deal of criticism from the rest of the team. The STs felt that they had been subjected to severe and unfair criticisms and that they had not been given enough time and space to reflect on the suggestions for improvement and gain ownership of the lesson. They wanted to abandon the activity initially but were persuaded by Yan King to go through another cycle to "give lesson study another chance". The team agreed to amend the procedures. In the second cycle, instead of preparing the lessons with the MTs, the STs worked on their own. They consulted the MTs only when they felt that they needed input. The rest of the procedures remained the same, with Si teaching the lesson first followed by Chung. The lessons improved substantially in terms of pedagogy and student response, and the conferences were much more focused on the lessons. The team was happy with the outcome and described the process as a "rich learning experience". The following section presents an analysis of the data collected to make sense of this change.

5.1. Analysis

To understand how the two cycles of lesson study developed over time, four post-observation confer-ences, each lasting 45 min, were transcribed and analyzed. In addition, interviews with and reflections by the MTs and UTs regarding their experiences of lesson study were examined. A grounded approach was adopted with no precon-ceived categories of analysis (Glaser, 1978). The discourse was interrogated according to whether the propositions in each speaking turn taken by the participants were evaluative or not. A distinction was made between whether they were focused (a) on the evaluation of personal performance in the enactment of the lesson plan, including the collec-tively prepared materials and strategies, or (b) on the lesson with no attribution to personal perfor-mance. For (a), a further distinction was made between whether the evaluation was positive, that is, "evaluation focused: positive" (EFP), or negative, that is, "evaluative focused: negative" (EFN). This distinction was necessary because the negative evaluations, understandably, were a source of anxiety for the STs. For (b), a distinction was made between whether the lesson-focused discussion was about pedagogy, that is, "lesson focused: peda-gogy" (LFp) or about content, that is, "lesson focused: content" (LFc). This distinction was made because the topic of the lessons—Chinese art and the underlying Chinese schools of thought—was difficult, even for the STs. The clarification of the STs' understanding of the content was a prerequisite to discussions regarding pedagogy.

A more detailed analysis of the evaluative propositions showed that some were self-evalua-tions made by the STs. The ability and readiness of the STs to evaluate their own teaching was an important indication of their reflectivity. Therefore, two more categories were identified: (1) self-evalua-tion by the ST, and (2) whether the evaluation was positive (SEP) or negative (SEN). A seventh category, self-explanation or justification (SE), was also identified to classify the explanations offered by STs in justifying their teaching or their under-standing of the content of the lesson. The unit of analysis in the study was the "idea unit", which consists of one or more than one proposition relating to the same idea. In some cases, an idea was illustrated with examples, and this was counted as one idea unit. However, there were cases where, in the course of providing an example, the speaker shifted from one idea to another. In such cases, the ideas were counted as two units. As the analysis was based on propositions, elicitations were not counted.

5.2. Findings

The findings of the analysis are presented in Table 1.

As we can see from Table 1, in the first cycle, a high percentage of idea units was focused on the evaluation of personal teaching efficacy in each of the two conferences, the first being on the lesson taught by the ST, Chung (42.4%), and the second being on the lesson re-taught by the ST, Si (48.7%). While there were equal percentages of negative and positive evaluations in the first conference (21.1%), in the second conference, the percentage of negative evaluation (38%) far exceeded that of positive evaluation (10.7%). It is also noteworthy that, compared with the first conference, in the second conference, there was a much higher percentage of self-explanation (14.9% versus 2.5%) and a lower percentage of self-evaluation (4.1% versus 7.3%). In the first conference, there was more emphasis on the evaluation of the lesson (48%) than on teaching efficacy (42.2%). However, in the second conference, there was a much greater emphasis on the evaluation of teaching efficacy (48.7%) than on the lesson (32.3%).

In the second cycle, however, the picture changed considerably. The third conference discussed the lesson first taught by Si, and the fourth conference discussed the lesson re-taught by Chung. The evaluative units in the third and fourth conferences dropped considerably from 42.2% and 48.7% in the first two conferences to 31.9% and 38.3%, respectively. There were also much higher percentages of positive evaluation than negative evaluation of teaching efficacy in the third (23.5% versus 8.4%) and the fourth (21.6% versus 16.7%) conferences.

The focus on the lesson remained high for both the third and the fourth conferences (47.9% and 40.2%). There were also considerably higher percentages of self-evaluation. The STs (mainly Si) engaged much more in self-evaluation (16.8%) in the third conference compared with the second conference (4.1%). Si was able to evaluate her own teaching positively (4.2% SEP) when compared with the first conference (0%), but at the same time, she was also more critical about her own teaching (12.6% SEN) compared with the first conference (4.1%). Similarly, the STs' (mainly Chung's) contribution to the fourth conference showed a similar pattern though the differences were not as marked. Chung engaged more in self-evaluation (10.8%) in the fourth conference than in the first conference (7.3%), and more in both positive self-evaluation (3.9% versus 1.6%) and negative self-evaluation (6.9% versus 5.7%). It is noteworthy that in both cycles, compared with the lessons that were taught for the first time (hereafter "first-taught lessons"), the re-taught lessons generated higher percentages of evaluation of teaching efficacy, and higher percentages of negative evaluation. There was also a stronger focus on content than pedagogy in the first taught lessons compared with the re-taught lessons.

The analysis of the interviews with the STs, Si and Chung, revealed that in the first lesson study cycle, they were both awed by the intensive mentoring that they received from the MTs and UTs. They found it daunting to incorporate all the input that was given to them on a single lesson. They put in a great deal of effort in lesson preparation and tried to follow the suggestions provided by the MTs and UTs, especially the guidance provided by the MTs with

Table 1
Analysis of post-observation conferences

Unit	(1st cycle)						(2nd cycle)					
	1st conferencing (%)			2nd conferencing (%)			3rd conferencing (%)			4th conferencing (%)		
EFP	26	21.1	42.2	13	10.7	48.7	28	23.5	31.9	22	21.6	38.3
EFN	26	21.1		46	38.0		10	8.4		17	16.7	
SEP	2	1.6	7.3	0	0.0	4.1	5	4.2	16.8	4	3.9	10.8
SEN	7	5.7		5	4.1		15	12.6		7	6.9	
SE	3	2.5	2.5	18	14.9	14.9	4	3.4	3.4	11	10.8	10.8
LFp	35	28.5	48.0	24	19.8	32.2	34	28.6	47.9	29	28.4	40.2
LFc	24	19.5		15	12.4		23	19.3		12	11.8	
	123		100.1	121		99.9	119		100	102		100.1

EFP = evaluation focused: positive; EFN = evaluation focused: negative; SEP = self-evaluation: positive; SEN = self-evaluation: negative; SE = self-explanation or justification; LFp = lesson focused—pedagogy; LFc = lesson focused—content.

whom they met very frequently. They were afraid of making mistakes. Si confessed that she took copious notes when Teacher Lo explained concepts in Chinese art to her; she was apprehensive that she would not be able to reproduce them in class without distortion. She said, "He (Teacher Lo) actually remembered exactly what he said to me and if I could not reproduce it well, he knew!"

In the first cycle, the STs were also caught in a dilemma of whether they should follow doggedly the suggestions provided or whether they should modify the lesson plan in response to the specific contexts of their classrooms. On the one hand, they felt that the lesson plans that had been drawn up were "perfect" because they had been collectively prepared with ample expert input. On other hand, they felt that no matter how good a lesson plan was, they should modify the activities and materials to suit their personal teaching style and the characteristics of their students. For example, the STs pointed out the differences between their classes. Chung's class loved activities and games, and was highly responsive. Si's class was more reserved; they loved to listen to the teacher and they tended to ask thought-provoking questions. However, the STs were apprehensive about modifying the lesson plans. For example, Chung was reluctant to make changes to the PowerPoint slides prepared by Teacher Lo for fear that he might distort his original intentions. The problem was particularly serious in the re-taught lesson in the first cycle. Si felt that what worked well in Chung's lesson might not work as well with her class. She felt that she needed to make modifications, but was not sure to what extent she should do so. She said, "you (referring to the MTs and UTs) gave us a lot of suggestions on how to revise the lesson (after Chung had taught the lesson)…then I had to think about how to implement them. I had to read more. When I did so, I found that I didn't quite understand the suggestions. So I had to make my own interpretations and add my own materials…. The result was a new set of materials." The question of how far they should keep to the original interpretation and how much autonomy they had plagued the STs.

When the enacted lessons were critically evaluated by the UTs and MTs, the STs were demoralized. On the one hand, they felt that they were unable to live up to the expectations of the whole team. On the other hand, they were resentful about the consequent severe criticisms of their teaching because they had to take sole responsibility for lessons which were collectively prepared. In addition, they considered it unfair that they were expected to rectify the "mistakes" made by the other ST when they re-taught the same lesson because their personalities and hence their personal teaching styles were quite different. They pointed out that they needed time and space to make sense of the input provided and to make their own decisions.

Like the STs, the MTs and the UTs put in a great deal of effort. Teacher Lo said, "I try to offer as much as I can. The reason why I am so direct in giving my comments is because I have high expectations for lesson study." However, like the STs, they were disappointed when the enacted lessons fell short of their expectations. Teacher Lo actually said (albeit in a non-threatening manner) that he was "very upset" when Si was not able to explain a concept properly since he had gone over it with her. In the conferences, both the MTs and UTs reminded the STs on a number of occasions of what had been planned or revised in the previous conference, and highlighted the gap between what was planned and what was enacted.

The interview data revealed that in the second cycle, when the STs were allowed more autonomy and flexibility, they were better able to respond to the needs of their students and make modifications to the collectively prepared lesson plan. They were also better able to critically examine their own practice, and suggest how they could improve on their own teaching. Looking back at the two cycles, Chung said that she did not feel as negative about the experience in the first cycle as she had initially felt. She had a better understanding of the input provided by the MTs and UTs, and felt that it was useful. After the second cycle, Si was much more positive about the whole experience. She felt a sense of empowerment.

Both the UTs and the MTs felt that since the lesson was collectively prepared, it was their responsibility to provide as much input as possible to help the STs. The unsatisfactory outcome forced them to re-examine the approach and together with the STs, the team decided that since a great deal of input had already been provided, the STs should be given the autonomy to make decisions regarding the selection of materials and the lesson plan. They agreed that both STs improved in their teaching in the second cycle, with Si showing dramatic improvement. They were much more confident and able to use the collectively prepared materials and

activities judiciously. They covered less material in the second cycle compared with the first cycle, but they were both more effective.

Yan King (UT) reflected on her initial understanding of lesson study and observed that her initial conception of lesson study as a mechanism for the improvement of teaching was simplistic. She confessed that the negative outcome of the first cycle was unanticipated. However, after the two lesson-study cycles, she had a better understanding of the tensions involved and the importance of resolving them. The positive outcome of the second cycle convinced her (as well as the rest of the team) of the importance of addressing problems that may arise during lesson study, rather than abandoning the tool. The MTs felt that the multiple perspectives and expertise afforded by lesson study were particularly enriching. For example, Teacher Lo said that he enjoyed seeing new ideas being used by the STs and that they provided an impetus for changing his own teaching strategies. He also felt that the process and culture of collaborative learning were very important. Teacher Wong felt that lesson study was a "genuine *guanmo* [4] (observing and improving) pedagogical model". She found the new perspectives provided by the UTs and STs particularly illuminating.

6. Discussion

6.1. Contradictions in the lesson study

The above findings show that lesson study, which was initially brokered by one of the UTs to resolve the contradiction between STs' learning and student learning, generated new contradictions. In the first lesson-study cycle, the evaluation of teaching efficacy of the STs who enacted the lessons constituted a substantial proportion of the conferencing interactions, especially in the second conference when a re-taught lesson was evaluated. This focus reduced the amount of discussion on the lesson, and minimized the opportunity for the STs to engage in self-reflection. The highly critical evaluation of the lessons, especially the re-taught lesson, made the STs defensive about their teaching. In other words, it appeared that the introduction of

lesson study as a mediating tool to resolve the competing objects of supervision by MTs and UTs generated new contradictions, which can be represented in Fig. 3.

The contradictions (indicated by the crooked arrows in Fig. 3) appear to have been caused by two factors. The first has to do with the difficulty caused by community boundaries. As mentioned before, the activity system involving three types of participants (*subjects*) was new to all participants. Although Yan King (UT) emphasized the non-evaluative nature of lesson study and the collective responsibility of the participants, the latter's actions were shaped by the rules of the respective communities of practice to which they belonged. The STs' perceptions of the roles and power relationships of the participants in the lesson study were no different. The STs saw their relationship with the MTs as that of "master-apprentice", and with the UTs as "teacher-student". Si felt that Teacher Lo treated her as his own student. The STs also saw both the MTs and UTs as "assessors" (see Fig. 3, [1]). Although the MTs said that they perceived the STs, as well as the UTs, as "partners" rather than students because they were also teaching their students, the negative evaluations of the STs, which were often direct and not hedged, were indicative of an unequal power relationship.

The second factor contributing to the outcome in the first cycle has to do with the contradictions inherent in lesson studies in which collective and individual elements are both present. While lessons are collectively prepared, they are individually enacted by teachers in the classroom. Similarly, while the lesson plan and the materials are revised collectively, the revised plan is enacted individually (see Fig. 3, [2]). These contradictions can give rise to tensions which may render the activity system dysfunctional if unresolved. This is evidenced by three problems which emerged in the first cycle. First, in post-lesson conferences, discussions of what worked and what did not work in the classroom became evaluations of the teaching efficacy of individual teachers. There were high proportions of personal evaluative units in the two conferences in the first cycle. Second, the collectively prepared lesson incorporated multiple perspectives and expertise from experienced MTs and respected UTs. Consequently, the STs were completely overwhelmed by the input from the MTs and UTs. They did not have enough time and space to make sense of the input and to gain ownership of the ideas. The

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[4]Guanmo is Putonghua. Guan means observing and mo means to improve on the basis of what you have observed. This is a very important process of learning in Chinese philosophy of education.

Mediating Tool:
Lesson study

[1]

Subjects:
MT
UT
ST

[1]

[2]

Object:
- content knowledge $(c=c_0)$
- pedagogical skills $(p=p_0)$
- student learning $(t=t_0)$

Outcome:
- content knowledge $(c=c_1)$
- pedagogical skills $(p=p_1)$
- student learning $(t=t_1)$

Rules:
- focus on lesson
- collective responsibility

Community:
- school

Division of Labor:
- MT, UT, ST:
collective lesson planning &
collective lesson evaluation
- ST: enactment of lesson

MT = mentors   UT = university teachers   = contradictions
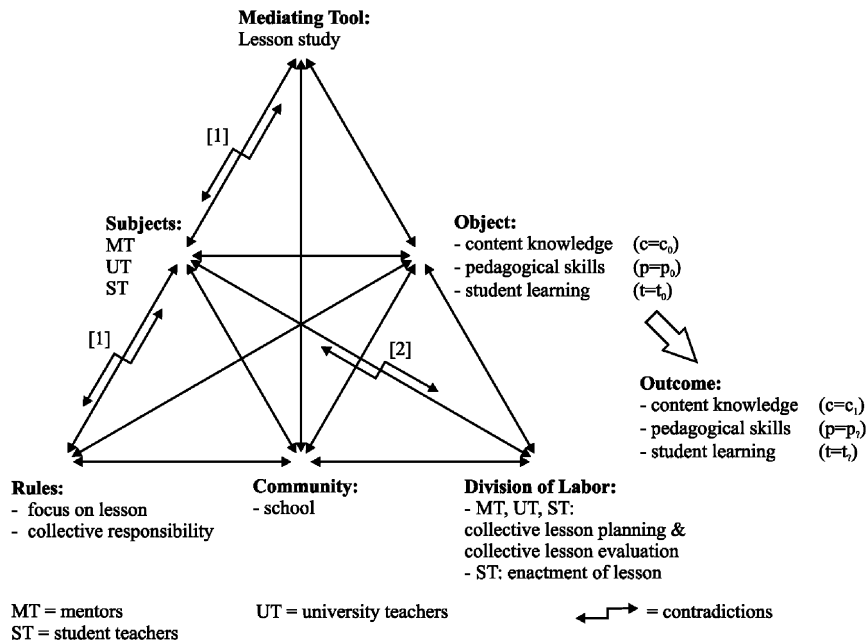ST = student teachers

Fig. 3. Lesson study as boundary object.

pooling of multiple expertise generated high expectations from all parties, as the interview data revealed. In addition, because the materials and tasks were collectively prepared, each participant had their own view of how they should be enacted. The multiple perspectives and multi-voicedness embedded in the artifacts could be stimulating, but they could also be overwhelming and devastating. In the first cycle, it was the latter. When the enactment of the lesson fell short of individual expectations, all parties were disappointed. This led to a higher proportion of negative than positive evaluations and caused a great deal of stress and anxiety. Third, the collective contribution to lesson preparation coupled with unequal power relationships among the participants, was obstructive to the development of professional autonomy. As the findings revealed, the STs' sense of ownership of their work as teachers was undermined. They were rendered powerless. They were unable to appropriate the collectively planned lesson to achieve the pedagogical objectives in their classrooms.

6.2. Resolving the contradictions: negotiating lesson study

In the second cycle, as we can see from the findings of the conferencing interaction analysis, the autonomy and flexibility given to the STs in the enactment of the collectively drawn up lesson plan were crucial. Not only were they more confident, they were also able to exercise their own judgment in the selection of materials and to respond to their students in a way that suited their personal teaching styles. The substantially higher percentages of lesson-focused discussions compared to the evaluation of teaching efficacy for both STs in the second cycle was indicative of the new understanding that all participants came to with regard to the function of the mediating tool and the object of the new activity system. The considerably higher percentages of self-evaluation showed that the STs were better able to examine their own practices in terms of how they could best help their students learn rather than how they could live up to the expectations of the UTs and MTs. Similarly, the UTs and MTs were less focused on whether the STs were able to enact the collectively planned lessons with high fidelity, but more focused on how the lesson could be effectively taught, irrespective of whether the pedagogical strategies were collectively planned or initiated by the STs. As can be seen from the MTs' and UTs' reflections on the experience, the mediating tool was reconceptualized as a tool for professional development for all participants, not just for the STs.

It must be noted, however, that there were unresolved contradictions. The re-enactment of a lesson initially taught by a different teacher to a different class of students raises the question of how one handles the variation in context and whether one can generalize across contexts. As can be seen in the conferences, in both cycles, there were higher percentages of evaluative units, predominantly negative, in the conferences on the re-taught lessons. This suggests that the assumption that a re-enacted lesson should be more effective than a first-taught lesson was problematic, especially when the contexts were different. As we have seen, this was one of the causes of frustration and resentment experienced by the STs. The resolution of such contradiction is likely to generate new forms of activity or culturally new patterns of activity. For example, research is being conducted in China on resolving this contradiction through conducting lesson studies over a sustained period, in some cases over a number of years, in order to formulate a repertoire of pedagogical strategies which the teacher could draw on in response to students of different capabilities and learning styles (see Gu, 2003).

7. Conclusion

In this paper, we have explored the expansive learning that took place when participants from different communities of practice crossed community boundaries. Lesson study was a boundary object brokered by one of the university tutors to mediate the learning experience. As we have seen, the adoption of lesson study as a mediating tool was intended to resolve the contradictions that were inherent in the boundary zone where participants from more than one community of practice were brought into mutual engagement. However, none of the participants, including Yan King, had a clear idea of what the lesson study would eventually look like and what the outcome would be. The study showed that while this particular lesson study resolved some existing contradictions, new contradictions were generated. Instead of interpreting this as a failure, the participants tried to resolve the contradictions through negotiation of meaning and consequently they not only came to a new understanding of lesson study, but also created a new mediating tool for learning. This new tool, which involved novice and experienced teachers led to a transformation of the activity system from the "supervision" of novices to the professional devel-

opment of both novices and experts. As Peter Drucker (2000) points out, there is a mutually interdependent and interactive relationship between tools and concepts. The use of a new tool, he observes, forces us to see things in a different way. In the study discussed in this paper, the new mediating tool transformed the learning experience: the participants came to a new understanding of their roles in the activity system, established a new relationship, and participated in the discourse in a different way. As Engeström points out, "In important transformations of our personal lives and organizational practices, we must learn new forms of activity which are not yet there. They are literally learned as they are being created. There is no competent teacher" (2001, p. 138).

At the beginning of this paper, we pointed out that new forms of communication, new relationships among hitherto unrelated groups, and new connections among apparently discrete domains brought about by globalization have led to re-negotiations of what it means to know and what it means to learn (Pea & Brown, 1991). The study reported in this paper illuminated our understanding of learning and knowing as a continuous process in which as we participate in new forms of activity and resolve contradictions, we come to a transformed understanding of the activity in which we are being engaged. This new understanding of learning as boundary-crossing has important implications for teachers and teacher educators. We should be not only concerned about how much our students know and whether they have acquired transferable skills, but more importantly, whether they have developed the capability to engage in expansive learning by tackling ill-defined problems through crossing community boundaries and collaborating with members of other communities of practice.

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