Negotiating the twin goals of student learning and teacher learning in a professional learning team

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Student learning often forms the key focus of teachers. In professional learning teams (PLTs), teachers engage in collaboration and inquiry with the aim of improving their students' learning. However, teachers who take on the role of facilitating their fellow teachers' learning in PLTs need to simultaneously manage the goals of student learning as well as of teacher learning. This paper discusses issues that teachers face in negotiating the twin goals of student learning and teacher learning in the process of meeting the challenges of technology integration. It argues for a reconceptualisation of professional learning that hinges upon the design of learning tasks offered to teachers in a PLT to help them address issues related to student learning without losing focus of their own professional learning.

Keywords: Teacher learning, professional learning team, professional learning community

Introduction

In order for teacher educators to design learning experiences that foster teacher learning, they need a nuanced appreciation of both the nature of pedagogy (for a teacher's work focuses on student learning) and of andragogy (for a teacher educator's work revolves around an understanding of how teachers learn). The shift of emphasis from off-site professional development approaches to on-site professional development approaches such as teacher learning communities (McLaughlin & Talbert, 2006) means that school teachers are increasingly being put in the position where they help foster the professional learning of their fellow teachers. As such, we broaden our definition of "teacher educator" to include school teachers who take on the responsibility of facilitating the professional learning of fellow teachers.

These teacher educators are in a unique and challenging position of having to simultaneously manage the goals of student learning and of teacher learning. Grossman, Wineburg, and Woolworth (2001) were of the view that learning communities should place equal emphasis on student learning and teacher learning because both form important foci in teacher professional development. Yet, they noted that examples of teachers simultaneously navigating both agenda of student learning and teacher learning were rare even in schools that subscribed to the ideals of learning communities. The literature is also relatively silent on this aspect of teacher professional development. This paper aims to answer the question of how teachers and teacher educators could negotiate the twin goals of student learning and teacher learning while meeting the challenges of technology integration in the curriculum. A brief literature review will first be made of the Professional Learning Team as a form of school-based professional development approach. This will be followed by a discussion of the research methodology and the presentation of our findings. We used two meeting excerpts to illustrate the tensions faced by teachers grappling with time-related issues on the surface and uncover the underlying challenges that teacher educators face with regard to fostering teacher learning in ways that will enhance student learning through the integration of technology. The paper will end with a discussion of how teacher educators may simultaneously negotiate the twin goals of student learning and teacher learning through the appropriate design of learning tasks presented to teachers.

School-based professional development

Teacher educators have debated about how to engage teachers in learning experiences that are powerful enough to transform their pedagogical practice and catalyze school reform (Putnam & Borko, 2000). Traditionally, teachers were sent for workshops for the purpose of improving their pedagogical skills. While such off-site learning experiences have the advantage of being able to remove teachers from the immediate constraints of their classroom situations to engage in the exploration of ideas, they have also been criticised for being too far removed from teachers' day-to-day work to make an impact on their practice, and for falling short of helping teachers situate what they have learnt in their own classrooms or school contexts (McLaughlin & Talbert, 2006; Putnam & Borko, 2000).

The development of on-site or school-based forms of professional development has been called for, based upon beliefs that learning is social in nature and that effective professional development requires teachers to interact and collaborate with one another to improve instruction and student learning (Ball, 1996; Lieberman & Mace, 2008; McLaughlin & Talbert, 2006). One example of school-based professional development approaches is the notion of the *Professional Learning Community* (PLC), an approach which has been described as being "undoubtedly in the ascendant in educational policy and practice (Stoll & Louis, 2007). Table 1 presents a summary of definitions crafted by some of the key authors of PLC literature.

Table 1: Summary of definitions of PLCs provided by key authors

Key Authors	Shirley Hord	Richard DuFour and colleagues	Louise Stoll and colleagues
Definition of "Professional Learning Communities"	One "in which the teachers in a school and its administrators continuously seek and share learning and then act on what they learn. The goal of their actions is to enhance their effectiveness as professionals so that students benefit. This arrangement has also been termed *communities of continuous inquiry and improvement."* (Hord, 1997, p. 1)	"A professional learning community is a group of educators committed to working collaboratively in ongoing processes of collective inquiry and action research in order to achieve better results for the students they serve" (DuFour, DuFour, Eaker, & Many, 2006, p. 14)	"A professional learning community is an inclusive group of people, motivated by a shared learning vision, who support and work with each other, finding ways, inside and outside their immediate community, to enquire on their practice and together learn new and better approaches that will enhance all pupils' learning" (Stoll, Bolam, McMahon, Thomas, Wallace, Greenwood, & Hawkey, 2006, p. 5)

One of the main strategies for fostering schools to be PLCs has to do with the creation of structures such as *Professional Learning Teams* ("PLTs"), defined as mini-communities of teachers from the same department or grade level who work together for the purpose of improving student learning (Sather, 2009). In addition, calls were made for schools to schedule regular common meeting times for teachers within PLTs, with the belief that such arrangements provide opportunities for teacher learning (Lieberman & Mace, 2008; Little, 1999).

A community is professional in nature only because the client forms the primary concern of the members of the community (Grossman et al., 2001). Hence, what teachers in a professional learning community do have an impact on the learning of their clients, that is, their students. This can also be seen in the expected outcomes expressed in the definitions of PLCs provided by key authors through the use of phrases such as "so that students benefit", "to achieve better results for the students they serve", and "new and better approaches that will enhance all pupils' learning" (see Table 1). The improvement of professional practice to impact student learning is only one aspect of teacher professional development. The other aspect lies in viewing teachers as members of a true "learning profession" (Darling-Hammond & Skyes, 1999) and as lifelong learners of their own disciplines (Darling-Hammond & McLaughlin, 1995; Grossman et al., 2001). However, it is a huge challenge for teachers to simultaneously manage the twin goals of focusing on their students' learning as well as paying attention to their own professional learning, especially in the "hurried context" of school (Grossman et al., 2001, p. 952).

Method

Research context

The work presented in this paper forms part of a research from an instrumental case study (Stake, 1995) conducted over a period of one academic year in a neighbourhood Primary school with six grade levels ranging from Primary 1 (P1) through Primary 6 (P6) and catering to children from ages 6 through 12. The school organised its teachers into PLTs with each comprising teachers who either taught the same grade level (in the case of teachers who used the English Language as the medium of instruction for subjects such as English Language, Mathematics, Science, Social Studies, Art, Music, and Physical Education) or the same subject (in the case of the teachers who taught the Mother Tongue Languages i.e. Chinese Language, Malay Language, Tamil Language). Overall, there were a total of nine PLTs in the school comprising six same grade level PLTs (i.e. P1 PLT, P2 PLT, P3 PLT, P4 PLT, P5 PLT, P6 PLT) and three Mother Tongue PLTs (i.e. Chinese Language PLT, Malay Language PLT, and Tamil Language PLT). Each of the six same grade level PLTs met weekly for one hour during its dedicated meeting slot held throughout the year. Out of a total of about 32 weekly meetings scheduled for the year, the school planned on devoting six sessions to discussions on readings taken from a book that focuses upon teaching skills, 12 sessions to lesson studies, leaving the remaining sessions for other forms of professional sharing e.g. sharing of lesson ideas. Each PLT had a Level Manager and Assistant Level Manager who decided on the agenda for each PLT meeting, with input from fellow teachers, and the School Staff Developer who oversaw the professional development of all staff. The first author attended the meetings of the P4 PLT over the course of one academic year in 2010. Field notes were recorded at all meetings, which were also video-recorded. Table 2 presents an overview of the profile of the teachers in the P4 PLT and their key roles in the school and in the PLT. All the names indicated are pseudonyms.

Table 2: Profile of teachers within the Primary 4 PLT

Study of interactions among teachers during meetings

Name	School experience (in years)	Key roles played within school and the Primary 4 PLT
Ms. Woo	28	School Staff Developer overseeing professional development of staff
Soo Kee	20	Advisor to the Level Manager
Noraini	18	-
Fei Yen	12	Facilitator for book discussions
Alice	9	Level Representative in the Health Education curriculum committee
Arief	8	Level Manager; in charge of preparing the agenda for the weekly meetings
Larry	5	Level Representative in the Mathematics curriculum committee, and Coordinator for lesson studies
Jane	2	Assistant Level Manager, and Level representative in the English Language curriculum committee
Siti	2	Level Representative in the Science curriculum committee

This study adopts the social theory of learning perspective (Wenger, 1998) where teacher learning is conceptualised as the social participation of teachers as they engage in and shape the practices within their PLT.

The examination of field notes, in combination with Interaction Analysis (Jordan & Henderson, 1995), was used to identify video segments for further study. Interaction Analysis is a video-based analysis characterised by the investigation of "human activities such as talk, nonverbal interaction, and the use of artifacts and technologies, identifying routine practices and problems with the resources for their solution" (p. 39). It involves the process of conducting a preliminary data scan of video recordings and keeping content logs that record information about events in each video and their timecodes for further reference. During the preliminary data scan, segments with interactional "hot-spots" (p. 43) were marked for more in-depth study of the interactions taking place among the teachers. Segments were then viewed repeatedly and transcriptions of the speech were made (refer to Figure 1 for the transcription conventions). The discourse was studied with the intention of examining the local knowledge of practice generated by the teachers in the PLT as they discussed matters pertaining to the use of technology to enhance student learning.

Transcription Conventions	
=	indicates latched speech where there is no gap between two turns
(.)	a very short untimed pause
<u>word</u>	underlining indicates speaker emphasis
e:r the:::	colon indicates lengthening of the preceding sound
-	a single dash indicates an abrupt cut-off
?	rising intonation, not necessarily a question
!	an animated or emphatic tone
,	a comma indicates low-rising intonation, suggesting continuation
.	a full stop indicates falling intonation
[ ]	indicates overlapping speech
( )	indicates a stretch of unclear or unintelligible speech
(shows picture)	non-verbal action

Figure 1: Transcription conventions used in transcriptions of meetings

Analysis of excerpts and findings

Context of the meeting

To illustrate the tensions faced by teachers within the P4 PLT as they grappled with having to simultaneously focus on matters pertaining to student learning while keeping their own professional learning in view, two excerpts taken from the second PLT meeting that took place in January 2010 will be discussed. The first 40 minutes were spent on a briefing conducted by the full-time school counselor and learning support coordinator to inform the teachers about students with special needs in various Primary 4 classes. Following some quick announcements by Arief and Jane, Larry proceeded to explain to the teachers on the use of a set of programmed Excel spreadsheets that had been prepared for teachers to teach the Mathematical concept of place value (e.g. the thousandth place value, the hundredth place value, the tenth place value etc). The programmed Excel spreadsheets (refer to Figure 2) included short scenario-based activities that involved students identifying the place values of different digits in numbers that ranged from single-digit to five-digit numbers expressed in monetary terms. A culminating activity designed for higher-ability students required the students to assume the role of a programmer who needed to fix an automated teller machine so that it showed the correct amount of cash withdrawn from the machine. This activity required the students to enter mathematical formulae into Excel

which were of the correct syntax and which made use of cell-referencing. Soo Kee asked Larry to demonstrate the steps used for entering a formula into a cell as she was not sure how to do so. Larry explained the procedure in a step-by-step fashion, showing specific cells to click on while entering a formula into the correct cell. In the course of his demonstration, Jane and Arief explained how a cell within Excel may be referenced as this was a skill required of Primary 4 students in line with the *Baseline ICT standards* which described specific ICT competencies (e.g. basic typing skills and skills in manipulating data in spreadsheets) that students needed to achieve at different milestones (Ng, 2008).
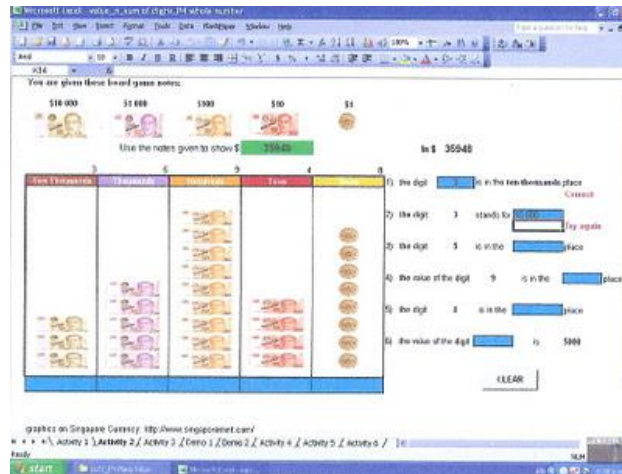

Figure 2: A screen shot of the programmed Excel spreadsheet used to teach place values

Soo Kee expressed her view that it was needful for the teachers to be able to see the step-by-step demonstration given by Larry so that they would be able to use the Excel spreadsheets in class. Larry, lamenting the lack of time, responded that such demonstrations were possible only if more time was allowed for the discussion of ICT-enabled Mathematics lessons. Ms. Woo felt that the issue of a lack of time could be addressed by having the teachers try the Excel spreadsheets on their own by following instructions in notes instead of spending time during the PLT meetings to go through the specific steps. Larry countered that the approach of asking teachers to try the resources on their own did not work in the past and Soo Kee added that notes could not sufficiently convey instructions required for step-by-step procedures. Figure 3 presents the transcript of two excerpts of the discussions that ensued.

Excerpt One of Meeting

21	Larry:	Actually, Ms. Woo, you see, all of us, our IT competencies are at different levels=
22	Ms. Woo:	=Yes=
23	Larry:	=So I, I feel, over these two years I feel that it may be good if we actually talk more about ICT lessons, and probably improve upon them, you see
24	Ms. Woo:	Because if it is like that, then it is basically not very professional, because it's just clicking but the pedagogy behind the teaching is not there. You're just showing them operational, you know what I mean?
25	Soo Kee:	I don't [think so. I feel that]
26	Larry:	[I don't think so.] Actually we need to teach why do we click this, you see? This one is referring to BY(i)TES, you see.
27	Ms. Woo:	Yea, those are only operational=
28	Soo Kee:	=But you see, the problem we had last year was that after every ICT lesson, we didn't even have time to come back and say "hey, is this useful or not?"=
29	Ms. Woo:	=Ah, <u>that</u> is important=
30	Soo Kee:	=So, we didn't even have that kind of time, so <u>every</u> ICT lesson, we didn't have time to review whether it was useful and ask "Okay, tell me, what were the areas for improvement? For the average classes, was it useful? For high ability? What else can we do to improve?" So, we don't have this kind of time, then end up we are like <u>always</u> rushing. At least now he shows us one step at a time. Last year, Mr Loh didn't even have time, he said "go and do it yourself". So, okay, do and die on your own (laughs).
31	Larry:	The, the reason is because=
32	Ms. Woo:	=So, this year, with one extra level meeting every month, we should be able to, but I'd rather you all cover that kind of things, rather than this kind of clicking, operational things, you know.
33	Larry:	Ms. Woo, it's not only clicking, you know, because it is more than that=
34	Ms. Woo:	=Because like in Excel, which cell to click can be taught =
35	Larry:	=It's not Excel only, you know, this is not talking about Excel only, you know. This is also about learning, like, about the place values, all these things. I was going very fast so I didn't explain to them, you see.
36	Ms. Woo:	(.) But, okay, that kind of=
37	Larry:	=There's also pedagogy, that's what I'm trying to say also=
38	Ms. Woo:	=Yes=
39	Larry:	=It is not only clicking=
40	Ms. Woo:	=If you can <u>concentrate</u> on the pedagogy, that's what we want, rather than concentrating on, you know, how to get the formula, that kind of things, kind of operational
41	Soo Kee:	For that one, I think he's quite fast=
42	Larry:	=I'm talking very fast, Ms. Woo, but there is really pedagogy. What I mean is I think we need time to talk about pedagogy.

43	Ms. Woo:	The group is given extra time this year. Every month, you are given one extra time so let's see how it works out, but rather than share about clicking, share about like what Soo Kee was talking about, after that what happened, before that what happened, you know? For example, why is it that we are teaching this whole thing, what is this whole activity <u>for</u> in the first place? You know?

Excerpt Two of Meeting

56	Larry:	There is a main objective also, it is all in the lesson plan already, if I have time, I would have gone through, you see.=
57	Ms. Woo:	=So why don't we concentrate instead on the why is it for, what is it for <u>here</u>, then the how to do it, can they try it out?
58	Arief:	(Shakes his head)
59	Jane:	No (J shakes her head)
60	Soo Kee:	But you see, cannot, it's connected,
61	Noraini:	Larry must tell us first.
62	Soo Kee:	You see, he can tell us what is it for, but if he doesn't tell you how to do it, you won't see the connection, you know. Then you cannot say "Oh, this can be used to teach that, I see."
63	Arief:	Not just that, the work about the Excel spreadsheet and other software need to be shown.
64	Ms. Woo:	Uh huh. Okay. How much time will you need, for example one lesson like that, how much time will you need to show, to explain, how much time do you need for one lesson to discuss, go through the pedagogy?
65	Arief:	It depends, if Excel spreadsheet, the first few take up a longer time, then the subsequent Excel spreadsheets will be fine, then later, we will do Geometer sketchpad, and then something new later, then Fun with Construction again.
66	Ms. Woo:	Then it will take time.
67	Larry:	The thing is that we are always left with no time to talk about pedagogy due to the lack of time. Do you realise?
68	Soo Kee:	Yes, I think the lesson review, review and the improvement on that lesson=
69	Ms. Woo:	=Yes, that part is more important=
70	Soo Kee:	=we only do it at mid-year, by that time, we would have forgotten all our lessons already.

Figure 3: Two excerpts of 18 January 2010 meeting

Students' competencies and teachers' competencies

While trying to explain the need for more time to be spent on ICT-enabled lessons, Larry cited the different ICT competencies possessed by teachers in the PLT as one reason (line 21 in Figure 3). In line 26, he also pointed out the need to teach students how to operate Excel spreadsheets as something required by BY(i)TES (acronym for *Benchmarking Your ICT Practices for Excellence in Schools*), a set of guidelines and performance indicators designed to help schools gauge the extent to which their integration of ICT in teaching and learning served to foster higher order thinking skills among students and a culture of experimentation and innovation within the school (Singapore Ministry of Education, 2007). Larry's reference to these guidelines suggests that the inclusion of certain task components in ICT-enabled lessons (e.g. referencing cells and inserting formulae in Excel spreadsheets) was made strategically in order to help students and the school achieve certain standards

articulated within the guidelines. Larry's comment about the need for certain standards to be met with regard to students' learning on the one hand and teachers' ICT competencies on the other hand highlights the fact that teachers in a learning community have two levels of learning that they need to attend to – the learning of their students, and their own professional learning.

Operational aspects versus pedagogical aspects

Ms. Woo was of the opinion that the teachers should not focus on such aspects of using the Excel spreadsheets as they were less "professional" (24) but more "operational" in nature (24, 27, 32, 40). Instead, she felt that the teachers should focus upon the "pedagogy behind the teaching" (24), something which Larry felt that he did attempt to do (33, 35) but did not manage to achieve due to a lack of time (37, 42). A dichotomy was drawn between the operational aspects and the pedagogical aspects of an ICT-based lesson.

On the one hand, the teachers linked the operational aspects of an ICT-based lesson to actions related to the actual operation of the ICT tool such as the clicking of cells (24, 26, 32, 34, 39) and the keying in of formulae (40). On the other hand, they linked the pedagogical aspects of an ICT-based lesson to discussions on lesson objectives (56) and how the lessons may be reviewed and improved upon (43).

When Ms. Woo again raised the suggestion to have teachers try the ICT-based learning resources on their own time so that meetings could focus on the rationale underlying the use of the resources (57), she met with objections from Arief, Jane, Soo Kee, and Noraini (58 through 63). Noraini insisted that it was necessary for Larry to demonstrate the steps to the teachers first (61) and Soo Kee felt that there was a very close connection between knowing how to operate the ICT-based learning resource and knowing how it could be used to teach a particular concept (62).

Larry's observation that "we are always left with no time to talk about pedagogy" (67) seems to suggest that the teachers often attended first to issues other than pedagogy when discussing lessons during such meetings. This was perceived as the usual practice, as indicated by Alice during an interview held after the meeting took place, when she raised her concerns about the use of time during meetings:

> … there are times when the facilitators try to help us in terms of ICT but the time spent on going through the process of clicking this, going to this web page to click on this, opening the files – all these manual, step-by-step processes – I don't think we can do them during the PLT meetings. This should be done at our work areas in the staff room on a one-on-one basis, with the one or two teachers who do not know how to do it. So, maybe we can cut down on time spent on these things. I was thinking that we need more sharing of pedagogy, like why do we have this ICT lesson, in what ways is it beneficial, what the whole package is all about, that's all. We don't need to talk about what to click on, which websites to go to, which files to open. (Excerpt of interview, 12 November 2010).

Alice shared Ms. Woo's view that while it might have been needful for teachers to know how to operate ICT-based lessons, meeting times should be spent on discussing pedagogical matters instead of showing teachers the specific steps. In the following section, we shall examine what discussing pedagogical matters during PLT meetings could entail.

Discussion

According to a study by the British Educational Communications and Technology Agency (Becta) on the barriers teachers faced in the use of ICT in their teaching and learning, a significant determinant of a teacher's level of use of ICT is the level of confidence felt, which in turn is related to other factors such as one's level of competence and the quality of professional development received (2004). With regard to professional development, both operational aspects as well as pedagogical aspects are needed. Preston, Cox and Cox (as cited in Becta 2004) noted that teachers need to understand aspects related to the basic workings of an ICT tool and how technical problems may be solved. In addition, teachers also need to be equipped in the pedagogical use of ICT, such as how ICT may be used to enhance student engagement and to support constructivist teaching approaches (Balanskat, Blamire & Kefala, 2006).

Teachers face pressures in the use of time (Little, 1999). On top of that, teachers perceive that more time is needed to explore the use of ICT, to deal with technical problems, and to use ICT in the

preparation of lessons and resources (Becta, 2004). Given that time is a limited resource, should teachers first address the operational aspects or the pedagogical aspects of the use of ICT in their teaching?

Snoeyink and Ertmer (2001) weighed the arguments for and against addressing operational aspects before pedagogical aspects in the professional development of teachers to help them integrate ICT into teaching. They concluded that teachers need to be equipped with the basic operations of an ICT tool before they could move on to address pedagogical issues, because without the technical know-how in the first place, the integration of the ICT tool into their teaching would appear out of reach. Likewise, Kissane (2003) proposed that mathematics teachers go through the first stage where they gain confidence through the learning of technical skills before they move on to the second stage where they learn how to manage pupil use of the ICT tool, then to stage three where they develop lessons incorporating the ICT tool before they progress to the final stage where they push curriculum boundaries in the incorporation of ICT into their practice.

At the same time, calls have been made for the use of new approaches of professional development related to the concepts of lifelong learning, knowledge sharing and peer learning where all teachers are looked upon as learners who shape their own learning process (Balanskat et al., 2006; Webb, Robertson and Fluck, 2005). However, the struggles faced by the teachers in the P4 PLT shows us that while the provision of organisational structures and the common time to meet as fellow professional learners is a very important step, more needs to be done to support teachers so that they may negotiate the twin demands of meeting student learning goals as well as attend to their own professional learning goals.

The struggles faced by the P4 PLT teachers seemed to be related to a lack of time for attending to both the operational aspects as well as the pedagogical aspects related to the use of ICT in their teaching. However, we surmise that what lies at the crux of the matter is the need for teachers to reconceptualise their own professional learning by way of being engaged as "learners in the area that their students will learn in but at a level that is more suitable to their own learning" (Wilson & Berne, 1999, p. 194).

This reconceptualisation requires the design of professional learning tasks that not only help teachers explore issues related to student learning, but which also help teachers foster their own professional learning. A strand of literature drawn from the study of mathematics education and which focuses on the interrelations between the learning of students, teachers, teacher educators, and educators of teacher educators (Zaslavsky, 2009; Zaslavsky, Chapman, & Leikin, 2003; Zaslavsky & Leikin, 2004) proves illuminative. Zaslavsky and Leikin (2004) built upon the concept of Jaworski's teaching triad (1994) which synthesises three elements involved in the creation of opportunities for students to learn mathematics. These three closely intertwined elements comprising the teaching triad of mathematics teachers include (1) the *mathematical challenge* which pertains to the way in which the teacher offers mathematics to his/her students depending on the students' learning needs and abilities, (2) the *management of learning* which pertain to a teacher's beliefs and strategies about teaching which shape the way lessons are conducted, and (3) the teacher's *sensitivity to students* inherent in how the teacher relates to the students based on his/her knowledge of individual students (Jaworski, 1994). Just as mathematics serves as a challenging content for students, the teaching triad of mathematics teachers serves as a challenging content for mathematics teachers (Zaslavsky & Leikin, 2004). Hence, the teaching triad associated with the work of a mathematics teacher educator (e.g. a teacher who facilitates the learning of fellow mathematics teachers) consists of the teaching triad of mathematics teachers, sensitivity to mathematics teachers and the management of mathematics teachers' learning. This conceptualisation gives rise to a nested triad as depicted in Figure 4. To foreground the types of learning that form the foci of the different levels of teaching triads, we added the labels "*student learning*" and "*teacher learning*" at the core of each triad; such a visual representation goes to show that classroom teachers who are tasked with facilitating fellow teachers' learning (i.e. teachers who take on the role of teacher educators) need to simultaneously negotiate the goals of two levels of learning – that of student learning as well as of teacher learning.
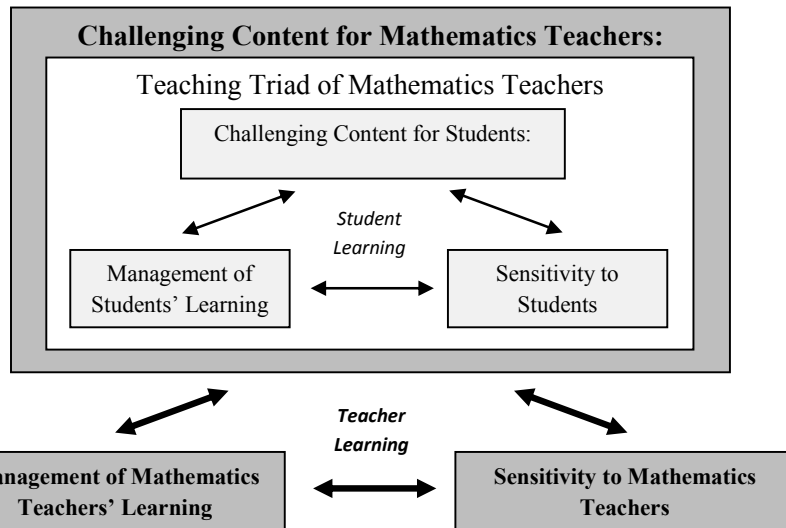
Figure 4: The teaching triad of Mathematics teacher educators
(adapted from Zavslavsky & Leikin, 2004)

Zaslavsky and colleagues argued that different levels of tasks needed to be designed depending on whether one was facilitating the learning of students, teachers, or teacher educators. For example, a task in the form of a problem sum offered to a student during a particular lesson should not be presented as it stands to teachers for their discussion but should instead be broadened to include questions designed to create doubt and conflict that will propel teachers to question underlying assumptions about the teaching and learning of mathematics. This is grounded upon the assumption that tasks which create doubt and conflict can surface subtle content and pedagogical issues that are not often addressed. This implies that the design of learning tasks is pivotal:

> On the one hand, tasks are the means and content by which learning is facilitated. On the other hand, through a reflective process of designing implementing, and modifying tasks, they turn into a means of the facilitator's learning. (Zaslavsky, 2009, p. 110)

With regard to the activity in the programmed Excel spreadsheets used by the P4 PLT teachers to teach the concept of place values, one of the students' tasks was to identify the place values of certain digits in a 5-figure value expressed in monetary terms. The Excel spreadsheet, programmed to provide immediate feedback for figures entered by the student, showed a visual representation of the 5-figure value in terms of $10000 dollar bills, $1000 dollar bills, $100 dollar bills, $10 dollar bills, and $1 coins arranged in the order corresponding to their respective place values (Figure 2). To foster teacher learning, instead of asking teachers to solve the student's task, an example of a broadened task that could be presented to teachers is to ask the teachers to discuss how a change in the order of the dollar bills (e.g. re-order the bills so that they appear in the order of $10000 dollar bills, $100 dollar bills, $10 dollar bills, $1 coins, $1000 dollar bills) could possibly affect the students' ability of arriving at the correct answer. Such a question could engage discussion on the use of ICT-based representations to scaffold understanding of place values as well as how and when such scaffolds may be faded. The discussion could potentially give rise to the design of questions involving higher-order thinking skills that require students to pay closer attention to the place values of the currency shown instead of assuming that the order of the dollar bills correspond to their respective place values.

To further flesh out the differences in the design of student tasks that facilitate student learning and the design of teacher tasks that facilitate teacher learning, illustrative details pertaining to challenging content for students/teachers, sensitivity to students/teachers, and management of students'/teachers' learning are shown in Figure 5. The details are not meant to be exhaustive but are presented to show an example of how teachers working in PLTs could negotiate the twin goals of student learning and teacher learning through a careful design of teacher learning tasks that keep both students' learning and the teachers' own professional learning in view. With regard to issues raised by the P4 PLT teachers, the ICT competencies of students/teachers may be addressed in the element pertaining to sensitivity to students/teachers while the operational/pedagogical aspects of the use of Excel may be addressed in the elements pertaining to sensitivity to students/teachers and management of students'/teachers' learning.
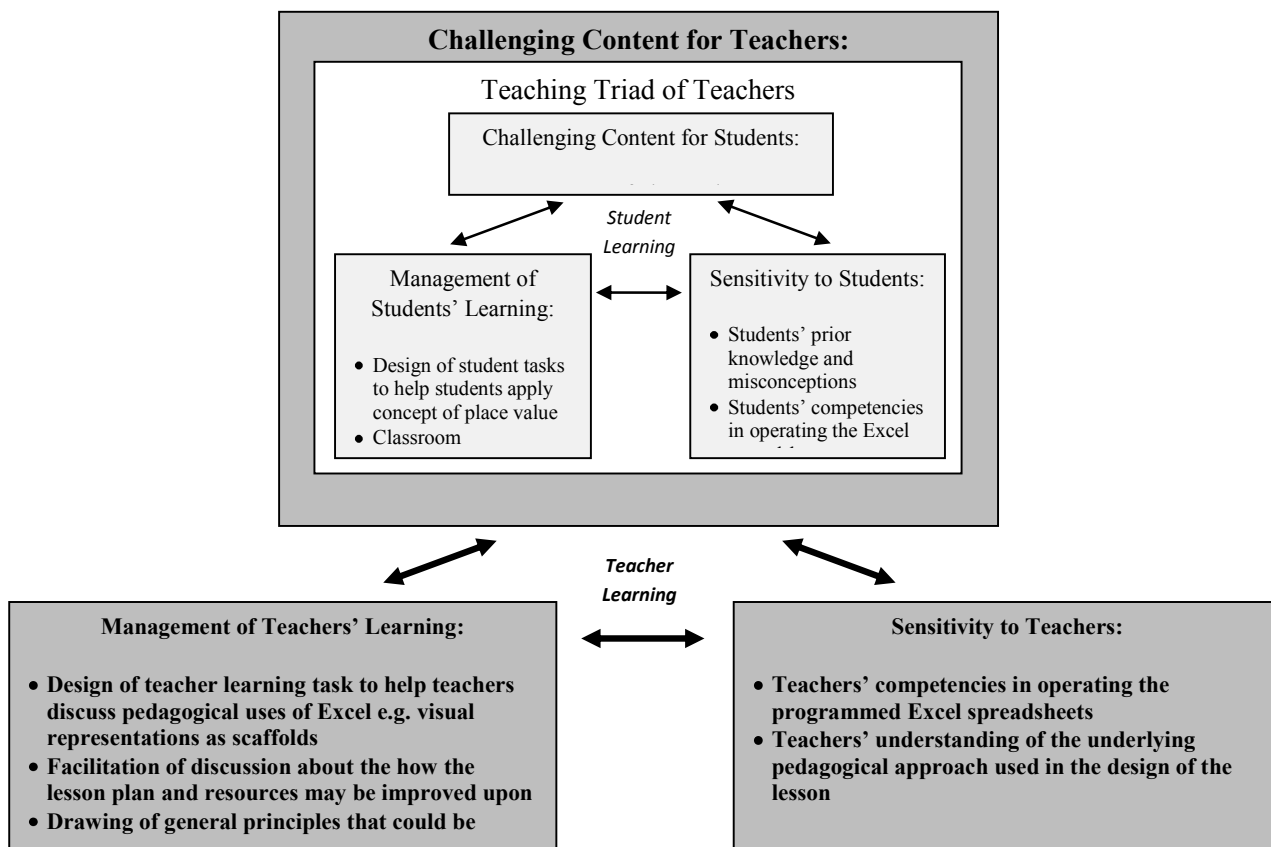
Figure 5: The teaching triad of teacher educators in relation to the use of programmed Excel spreadsheets to teach the concept of place values (based upon Zavslavsky & Leikin, 2004)

Conclusion

The lack of research investigating how teachers shape their peers' learning in professional learning communities is a concern, especially when the responsibility for teacher learning has been placed upon teachers themselves during a time when more and more educators tout school-based professional development approaches as being more effective than off-site professional development approaches. However, the provision of structures that enables teachers to meet regularly as members of professional learning teams, while important, are insufficient in helping teachers to effectively facilitate their peers' learning. Due to the close link between teacher learning and student learning, there is a need to engage teachers in reflection that monitors how changes in their own learning impacts the learning of their students (Stoll, Fink & Earl, 2003). We presented the concept of nested teaching triads by Zaslavsky and Leikin (2004) and argued that the nature of the learning task offered to teachers in a PLT plays a pivotal role as teachers' reflection may be stimulated through the appropriate modification or broadening of learning tasks that are offered to students. While originally conceptualised for mathematics teachers and mathematics teacher educators, the notion of nested triads could be applied to other subjects as well. Schools need to consider how facilitators of teacher learning may be supported in their endeavour of designing tasks offered to teachers to raise the quality of their learning to a level that is commensurate with the type of student learning envisioned by school reformers.

References

Balanskat, A., Blamire, R., & Kefala, S. (2006). *A review of studies of ICT impact on schools in Europe*: European Schoolnet.

Ball, D. L. (1996). Teacher learning and the mathematics reforms: What do we think we know and what do we need to learn? *Phi Delta Kappan, 77*, 500-508.

British Educational Communications and Technology Agency. (2004). *A review of the research literature on*

barriers to the uptake of ICT by teachers. Retrieved from http://www.e-learningcentre.co.uk/Resource/CMS/Assets/5c10130e-6a9f-102c-a0be-003005bbceb4/form_uploads/Literature_review___barriers_to_the_uptake_of_ICT_by_teachers.pdf

Darling-Hammond, L., & McLaughlin, M. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan*, *76*(8), 597-603.

Darling-Hammond, L., & Skyes, G. (Eds.) (1999). *Teaching as the learning profession: Handbook of policy and practice*. San Francisco, CA: Jossey-Bass.

DuFour, R., DuFour R., Eaker, R., & Many, T. (2006). *Learning by doing: A handbook for professional learning communities at work.* Bloomington IN: Solution Tree.

Grossman, P., Wineburg, S., & Woolworth, S. (2001). Toward a theory of teacher community. *Teachers College Record, 103*(6), 942 - 1012. https://doi.org/10.1111/0161-4681.00140

Hord, S. M. (1997). Professional learning communities: What are they and why are they important? *Issues... about Change, 6*(1). http://www.sedl.org/change/issues/issues61/Issues_Vol6_No1_1997.pdf

Jaworski, B. (1994). Investigating mathematics teaching: A constructivist enquiry. London: The Falmer Press.

Jordan, B., & Henderson, A. (1995). Interaction analysis: Foundations and practice. *The Journal of the Learning Sciences*, 4(1), 39-103. https://doi.org/10.1207/s15327809jls0401_2

Kissane, B. (2003). A model for professional development for graphic calculator use. Proceedings of The Mathematics Education into the 21st Century Project International Conference, Czech Republic. Retrieved from http://math.unipa.it/~grim/21_project/21_brno03_kissane.pdf

Lieberman, A., & Mace, D. H. P. (2008). Teacher learning: The key to educational reform. *Journal of Teacher Education, 59*(3), 226-234. https://doi.org/10.1177/0022487108317020

Little, J. W. (1999). Organizing schools for teacher learning. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 233-262). San Francisco, CA: Jossey-Bass.

Loughran, J. J. (2006). *Developing a pedagogy of teacher education: Understanding teaching and learning about teaching*. London ; New York: Routledge.

McLaughlin, M. W., & Talbert, J. E. (2006). *Building school-based teacher learning communities: Professional strategies to improve student achievement*. NY: Teachers College Press.

Singapore Ministry of Education. (2007). Benchmarking Your ICT Practices for Excellence in Schools BY(i)TES. Retrieved from http://moeleadership.iste.wikispaces.net/file/view/BY(i)TES+2.1.pdf

Ng, E. H. (2008). *Opening Address at the International Conference on Teaching and Learning with Technology (iCTLT).* Speech presented at the Suntec Convention Hall, Singapore. Retrieved from http://www.moe.gov.sg/media/speeches/2008/08/05/opening-address-by-dr-ng-eng-h-1.php

Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*(1), 4-15. https://doi.org/10.3102/0013189X029001004

Sather, S. E. (2009). *Leading professional learning teams: A start-up guide for improving instruction*: Thousand Oaks, CA: Corwin. https://doi.org/10.4135/9781483350561

Snoeyink, R., Ertmer, P. (2001). Thrust into technology: How veteran teachers respond. *Journal of Educational Technology Systems*, *30*(1), 85-111. https://doi.org/10.2190/YDL7-XH09-RLJ6-MTP1

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.

Stoll, L., Bolam, R., McMahon, A., Thomas, S., Wallace, M., Greenwood, A., & Hawkey, K. (2006). *Professional learning communities: Source materials for school leaders and other leaders of professional learning. Booklet 1: User guide: Getting started and thinking about your journey*. London: DfES Innovation Unit, NCSL and GTC.

Stoll, L., Fink, D., & Earl, L. M. (2003). *It's about learning (and it's about time): What's in it for schools?* London: Routledge/Falmer.

Stoll, L., & Louis, K. S. (2007). *Professional learning communities: Divergence, depth and dilemmas*. Maidenhead: McGraw-Hill/Open University Press.

Webb, I., Robertson, M., & Fluck, A. (2005). ICT, professional learning: Towards communities of practice. *Journal of In-service Education*, *31*(4), 617-633. https://doi.org/10.1080/13674580500200388

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*: New York, NY: Cambridge University Press. https://doi.org/10.1017/CBO9780511803932

Wilson, S. M., & Berne, J. (1999). Teacher learning and the acquisition of professional knowledge: An examination of research on contemporary professional development. *Review of Research in Education, 24*, 173-209. https://doi.org/10.3102/0091732X024001173

Zaslavsky, O. (2009). Mathematics educators' knowledge and development. In R. Even, & Ball, D. L. (Eds.), *The professional education and development of teachers of mathematics: The 15th ICMI study* (pp. 105-111). NY: Springer. https://doi.org/10.1007/978-0-387-09601-8_12

Zaslavsky, O., Chapman, O., & Leikin, R. (2003). Professional development of mathematics educators: Trends and tasks. In A. Bishop (Ed.), *Second international handbook of mathematics education* (pp. 875-915). Dordrecht: Kluwer Academic Publisher. https://doi.org/10.1007/978-94-010-0273-8_28

Zaslavsky, O., & Leikin, R. (2004). Professional development of mathematics teacher educators: Growth through practice. *Journal of Mathematics Teacher Education*, *7*, 5-32. https://doi.org/10.1023/B:JMTE.0000009971.13834.e1

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