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Lesson study as a vehicle for collaborative teacher learning in a secondary school

Abstract

Lesson study is recommended to schools as a powerful approach to the development of teacher learning. This paper reports the outcomes of a ‘Lesson Study’ project conducted in a Mathematics department with four serving teachers in a secondary school in England. Using Dudley’s lesson study framework and, drawing on Hargreaves and Fullan’s notion of professional capital, the feasibility and value of collaborative lesson study as a vehicle for the development of teacher learning was explored. Planning and evaluation meetings as well as end-of-project interviews were analysed to investigate how teachers planned research lessons together and how these were evaluated. Despite time constraints, teachers who engaged in lesson study reported that the process improved understanding of their students, that collaboration helped them to develop less-teacher-centred approaches and created a stronger sense of teacher community. The project demonstrated that lesson study has potential as an alternative or complementary model of teachers’ learning, but it also throws up substantive organisational challenges if its use is to expand.

Introduction

Lesson Study is a classroom-based, collaborative mode of professional learning originating from Japan (‘jugyou kenkyuu’ meaning lesson study). It 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’ (Tsui and Law 2007, p. 1294). Typically, a lesson study cycle will involve small groups of teachers collaboratively planning a ‘research lesson’ which one teaches while other members of the team observe with

a focus on the learning and participation of selected case pupils (Dudley 2013). The lesson is then evaluated and revised for further teaching to other groups (Hiebert and Stigler 2000). Such lessons, subjected to systematic collaborative analysis by participating teachers, are called '*research lessons*' or '*study lessons*'. A feature of lesson study that distinguishes it from other forms of professional learning is the focus on the observation of students' learning during a lesson as the key to pedagogic development rather than on an individual teacher's performance.

While extensively used in the Far East and North America, lesson study lacks an established empirical base in UK mainstream settings, although the studies by Dudley (2013), Ylonen and Norwich (2012) and Norwich and Ylonen (2013) have recently developed useful insights. The purpose of this paper is to explore the potential of lesson study for advancing professional practice and teachers' learning in the English secondary context. A feature of this context is the frequent summative evaluation of the quality of teachers' classroom practices based on lesson observations against inspection criteria (set by the Office for Standards in Education, OfSTED). The focus of inspections on individual teacher performance gives rise to a culture centred on what the individual teacher does and how s/he manages and structures a lesson. These are, of course, important facets of a teacher's repertoire and skill. The problem is that there is little scope in the prevailing inspection regime for building a professional development discourse that brings the learning and participation of students into a more rounded pedagogic focus and evaluation.

In contrast to the prevailing focus on individual teacher performance, Hargreaves and Fullan (2012) propose the concept of 'professional capital' comprised of three elements:

- *Human Capital*: the development of individual expertise.
- *Social Capital*: the extra utility and expertise which comes from individuals working collaboratively.

- *Decisional Capital*: the opportunity given to professionals to use their expertise to make decisions for positive change in their practice.

In many cases, attempts to improve education have involved activities and changes to structures which do not focus specifically on teaching and learning, and by extension, the work of teachers seeking to engage students in meaningful learning in the classroom.

Hargreaves and Fullan argue for a fundamental change in the work of schools based on collaboration and capacity building amongst the teacher body itself. From their interest in the development of schools emerges the concept of professional capital, which is based on the philosophy that ‘we must invest in developing teachers’ capabilities and give them time to sharpen these capabilities to a high standard’ (Hargreaves and Fullan 2012, p. 45). As a result, they argue that we need to find vehicles for teacher collaboration that enhance professional capital.

Such vehicles might include lesson study, the principal aim of which is to establish the learning, participation and engagement of pupils as a central focus of teachers’ learning and practice development (Dudley 2013). Dudley suggests that its collaborative student-focused approach offers teachers the opportunity to work together (developing social capital). This would offer teachers time to focus on the effects of their teaching on students’ participation and engagement. This process of collaboration is characterised by authentic decision-making within the group, thus providing opportunities for the development of decisional capital. This paper explores the potential of lesson study as a vehicle for professional learning and practice development (teachers’ professional capital) in a secondary mathematics department through a cycle of two research lessons taught in Years 8 and 9.

Lesson study as a vehicle for professional learning

Impetus for the use of lesson study outside Japan has derived in part from the results of international comparisons of student outcomes, for example, TIMSS (1999) and PISA (OECD 2001) in which students in some countries performed much better than those in other advanced economies. In the USA, disappointing TIMSS results led Stigler and Hiebert in *The Teaching Gap* (1999) to argue that more successful systems had ways of improving teaching that involved much more than a focus on individual teacher performance. The USA had no system in place for the improvement of teaching (1999: 10). Since the publication of *The Teaching Gap*, there has been sustained interest in lesson study particularly in North America (Fernandez, Cannon & Chokshi 2003; Lewis 2000, 2009; Lewis, Perry, Hurd and O'Connell 2006), often in contexts of mathematics teaching (for examples, see Hart, Alston and Murata 2011). It is argued that lesson study builds the quality of 'teaching' over time (Stigler and Hiebert 1999), provides collaborative opportunities for capacity building and contrasts with the quick-fix 'solutionism' of other approaches that claim to 'drive up' standards, criticised by Hargreaves and Fullan (2012). Papers published about lesson studies have given rise to a number of claims, for example:

- It is the usefulness of the lesson for helping students' overcome their difficulties, and not teachers' performance in conducting the lesson, that shapes professional learning in lesson study (Stigler and Hiebert 1999; Lewis 2009). Teachers' understandings of difficulties that students encounter with particular aspects of their learning are at the heart of the process.
- Pre-lesson planning and post-lesson evaluation meetings provide discursive opportunities for detailed planning and in-depth reflection about the quality of teaching and learning (Lewis 2009).
- Collaboration in lesson study can help teachers to 'develop a sense of collective efficacy so that mandates like standards-based instruction feel less overwhelming' (Lewis, Perry, Hurd and O'Connell 2006, p. 276).

However, some warning messages also emerge, in particular with regard to challenges teachers face in carrying out lesson studies. Fernandez, Cannon and Chokshi (2003) demonstrate the need for clear understanding of the lesson study process and its essential focus on the observation of student learning if it is to be effective. Other problems relate to negative forms of collaboration among teachers including the uncritical acceptance of ideas and the failure to question one another's assumptions (Parks 2009, p. 95). Furthermore, there is concern that lesson study might be treated as another here-today-gone-tomorrow initiative (Murata 2011, p. 9) after which teachers move on to the next 'new thing'. Despite such concerns, the overwhelming message from lesson study literature is that it is a powerful dynamic approach to teachers' professional learning (Fernandez 2002; Lewis and Tsuchida 1997; Puchner and Taylor 2006; Lim, Lee, Saito and Haron 2011; Lewis, Perry, Friedkin and Roth 2012).

Dudley (DCSF 2008) introduced lesson study to primary schools as part of the Primary National Strategies (government-funded school improvement initiatives in England) and there has been a strong recommendation for its introduction to policy-makers in Northern Ireland (Galanouli 2010). The National College for School Leadership (2013) has also begun to promote the use of lesson study, arguing that it impacts positively on teacher learning and student outcomes. Consequently, we were puzzled to find that there have been relatively few studies of lesson study in the United Kingdom, with the exception of a small number of papers (Ylonen and Norwich 2012, Norwich and Ylonen 2013; Tall 2008; Dudley 2012a, 2012b). Ylonen and Norwich (2012) focused on the efficacy of teachers using lesson study with a series of lessons over two terms for students with moderate learning difficulties in a secondary school. Teachers in their study reported that lesson study led to a stronger focus on students' learning and greater willingness to take the risk of devolving responsibility for learning to students (2012, p. 312-313) for example with practical hands-on activities.

Dudley's research (2013) focused on teachers' learning in lesson study contexts. He explored through analysis of teachers' discourse in planning and evaluating research lessons how teacher learning was co-constructed in lesson study projects, concluding that it offers a fruitful approach to the development of teacher learning, including the building of social capital (p. 116). Despite these important and informative recent studies, we have to accept that lesson study research is still relatively young in the UK.

The Study

The setting for the study was an urban secondary school in the East Midlands region of England. The school has a history of engagement in school improvement initiatives and school-university partnerships for teacher education. The research lessons were developed and taught over a period of six months. We explored two research questions: first, how participating teachers worked together to plan research lessons and, secondly, how they evaluated their research lessons.

Underlying these questions was a framework for thinking about teachers' learning that draws on social constructivism with its emphasis on how learning is influenced by social interaction and by active processes of constructing understandings, making sense of experiences and building on one another's knowledge and expertise. We were interested in how individuals collaborated in a lesson study project and how the process might contribute to the growth of their professional capital.

Data Collection

The school agreed to support four teachers (three female, one male, with pseudonyms below) who had varying levels of experience and responsibility:

- The senior maths teachers (Mita) was the second in the mathematics department

- The second maths teacher (Sam) had three years of experience
- The third and fourth maths teachers were newly qualified teachers (Chloe/Viv)

Teachers were inducted into the project at an initial meeting with two of the research team who drew on Dudley (2011) to explain the lesson study process. Figure 1 represents the process the group followed:

HERE

Figure 1. Outline of the Lesson Study project

Researchers did not participate in the planning of the research lessons nor in their observation, but received self-recorded data from the participants (pre-lesson and post-lesson evaluation meetings, films of lessons, lesson plans and copies of resources). Lessons were filmed and viewed separately by both teachers and researchers. At the end of the project, following the second evaluation meeting (stage 5 in figure 1), informant style interviews (Powney and Watts 1987) were conducted to elicit contextualised accounts of teacher learning during the project, teachers recounting what was salient to them in the process and how it had influenced their thinking and practice. Informants were asked to recall their experiences during planning and evaluation meetings. Through these interviews, we supported the participating teachers to develop their own accounts of the process and the effects of lesson study on their thinking and practice.

Data Analysis

The research was qualitative, inductive and exploratory in its mode of enquiry. Initially, all planning and evaluation meetings were transcribed and subjected to a preliminary general analysis by four researchers engaged in the project, familiarising ourselves with data through

close reading of transcripts. Video recordings of lessons were viewed by two researchers to compare the content of lessons with that of planning and evaluation meetings. This was followed by detailed thematic analysis of the planning/evaluation meeting transcripts by two members of the team.

Analysis focused on how teachers planned and learned from the two research lessons in the lesson study cycle. It proved necessary to conduct several sweeps through the data while listening to recordings and watching films of the lessons to arrive at even a partial understanding. The initial two sweeps led to a process of chunking the transcripts into episodes or stanzas (Gee 2011) to capture the generic structure of the meetings. This macro-analysis of the planning meetings revealed the episodic structures in table 1 below.

HERE Table 1: macro-structure of planning meetings

Each of the episodes was subjected to further detailed content analysis independently by two researchers to strengthen internal validity. Each episode was broken down into thematic units and codes were ascribed to each unit. This analysis was conducted from a grounded theory perspective using a constant comparison approach with no pre-determined categories for analysis. The process included a 'rater' reliability check (85.8% agreement across planning and evaluation meetings) leading to agreement on the final coding (represented below in table 2).

End-of-project interviews were transcribed and read line-by-line by all members of the research team to arrive at an initial holistic view of teacher thinking. Following this group analysis, two members of the team, again working independently, engaged in a detailed comparative study of responses to arrive at a commonly agreed set of themes emerging from the discourse. This paper focuses in detail on the planning and evaluation meetings but also draws on the accounts teachers gave in the end-of-project interviews.

Findings

Discussion of findings is divided into two sections, the first reporting how teachers planned research lessons together and the second focusing on ways in which the two research lessons were evaluated.

Collaborative Planning Meetings

Researchers divided planning meeting transcripts into 479 thematic units and identified eight themes, the first six considered to be substantive content themes (for example, pedagogy or the learning challenge) while two were categorised as ‘function’ themes, theme 7 discussing organisational issues associated with lesson study and theme 8 the echoes of agreement and support used by participants in the discourse (see table 2). Statements about logistics such as the time of the lesson and who should be contacted about equipment accounted for 11% of the themes identified. Furthermore, in each meeting, there was a significant amount of supportive, collaborative talk (theme 8 below) about which another paper is in preparation.

HERE Table 2: content themes in the planning meetings

Detailed analysis of thematic units in each episode revealed that approaches to teaching (theme 1) dominated the discussion and led to plans that mirrored a four-part lesson structure proposed by the *Teacher Effectiveness Programme* (TEEP, <http://www.teep.org.uk/>), which many schools have adapted or accepted as a template for their lessons. Typically, this involves beginning the lesson with a ‘connect’ phase, a starter or ‘through the door’ activity

that recalls what students know already. The sharing of learning outcomes, with teachers making explicitly clear what is expected during the lesson, is a key part of this phase. The second part is called the ‘activate’ phase which presents the problem, the concept or new learning and may involve students working in groups or with talk partners. This is followed by the ‘demonstrate’ phase (sometimes called ‘apply to demonstrate’) in which students engage in activities that demonstrate their ability to use skills to solve the problem or work with the new learning. The ‘consolidate’ phase (often referred to as a plenary) involves review of learning and reflection upon the new learning. Analysis of planning meetings indicated that the case study school is heavily influenced by TEEP’s recommendations for lesson-planning and this led, in both cases, to discussions about setting objectives, agreeing a starter activity, discussing and designing the main activities and then deciding how to conduct a plenary review of learning. This occurred even though the meetings were not chaired and there was no written guidance to structure their focus and content and reflects the tendency in England since the turn of the century for teachers to adopt a three or four part lesson structure (OfSTED 2003). The discussion led to the planning of two research lessons for Years 7 and 8 (table 3):

HERE Table3: content and focus of research lessons

In both planning meetings, the structure of the discussion was clearly influenced and framed by TEEP but the principal focus of discussion was, nevertheless, the exploration of interactive approaches to teaching. For the first research lesson taught to Year 7, the teachers explored the complexity of converting fractions, decimals and percentages, often rehearsing the physical and cognitive processes they expected learners to go through. Much of the discussion focused on activities that would devolve responsibility to learners, engaging them in practical tasks such as *‘find your partner/family’* activities for the matching of fractions and decimals. However, discussion of approaches frequently occurred in truncated fashion

with apparently incomplete explanations and suggestions. The following exchange about the design and timing of the interactive *'find your family'* activity underlines the short cuts that are possible due to the assumed shared knowledge in the lesson study group:

Mita: *And then put like fractions decimals or percentage at the back of the room and they've got to stand with their family I'm just thinking I don't know if it'll fit in.*

Chloe: *So they'll recognise them which are which, or?*

Mita: *Yeah*

The learning challenge (theme 2) for the second research lesson (taught to Year 8) was how to measure surface area of different box shapes. In working out how to teach the lesson, theme 1 again dominated as participants sought to unlock approaches that would enable students to work through their misconceptions and arrive at a clearer understanding. When reviewing how students might work out surface areas independently, the teachers co-constructed the approaches, including tasks and groupings, while taking account of the risks and adjustments that would be needed. For research lesson 2, this brought about agreement on a much less teacher-led approach than was their usual practice:

Mita: *So they can break down boxes,*

Viv: *..... and then they can do that in pairs.*

Mita: *So would you just like say to them after this activity that we've recapped, would we like talk about surface area and what about this, and then you'd say ok, how much would you need to make this box, or would you just let them?*

Viv: *Maybe let them discover it...*

Sam: *Yeah, let them discover it, work out the area...*

Chloe: *It might go horribly wrong in which case you'd still have to teach it, but...*

Mita: *Yeah.*

Viv: *But they can at least have a go and do something a bit different.*

Searching for pedagogic solutions characterised planning meetings. In the following extract, Chloe (who taught the lesson) responds to suggestions from Mita and Viv and modifies her thinking about how students could engage in measurement of surface areas:

Mita: *Would you have... yeah, so actually what you've... the cards that are given out could be in the actual shape of the face, and they have to make it by putting it together or something like that. Is that what you were thinking?*

Chloe: *Well, it's not what I was thinking but that would be a good idea. I was thinking just a card with it drawn on and with the measurements on. But having...hmmm .. that might be even better.*

Mita: *Would that be too difficult for the people who actually need help to have to put the boxes together?*

Viv: *Actually no. They should be able to look... if they've got the faces ready it shouldn't...*

They agreed that an interactive discovery approach would be maintained throughout the lesson which would have a strong focus on engaging students in reasoning about the process of measurement:

Mita: *And then for that last one, the scaffolding could be just give them a cylinder made of card and get them to see if they can work out what their net would look like and say you might need to cut it down the middle or something. That's too much of a hint. (LAUGHTER)*

The teachers in both meetings also spent a significant amount of time clarifying the learning challenge (Theme 2), subject content and how students learn mathematics, for example when identifying the relationships of equivalence between fractions, decimals and percentages:

Viv: *What concepts are we trying to get over? (Pause: 2 seconds) so the whole thing of equivalents the whole thing of the fact that they're numbers on the number line*

Sam: *... how do they get from twenty five per cent to a quarter to 0.25?*

The discussion of how to teach in response to the learning challenge remained the dominant focus in the meetings and subsequent film and lesson plan analysis confirmed that the research lessons had the structure in table 3 above, much influenced by the TEEP plan also described above.

Several exchanges illustrated how this lesson study team configured the learning challenge (theme 2) but participation in discussions was not even. It was noteworthy that Sam, although supportive throughout the lesson study project, made very few contributions to the discourse. Nevertheless, he was very positive and very forthcoming in the end-of-project interview about the value of lesson study, particularly benefits deriving from collaboration in planning.

The process of arriving at a common understanding of the purpose of the lesson and agreement about clear objectives (theme 3) was time-consuming, which led one participant to take the initiative and give clear direction to the planning meeting, for which there was not a formal chair. On this occasion, Chloe who was the nominated 'teacher' of the second lesson, took the initiative to make sure that clear objectives were specified and the associated approaches to teaching:

It took us a while to nail down actually what we were going to do it on and I think I probably pressed quite hard for us to write down some kind of lesson objectives

because people had lots of ideas and it wasgoing in a slightly different direction so we needed to nail down actually what specific thing we were trying to do (Chloe)

Discussion about learners (theme 4) tended to focus on predicting what they might find difficult or how they might react, for example their possible confusion about the terms ‘ascending’ and ‘descending’ to describe number:

Smallest measures yeah then you could involve ascending and descending figures I know some students are in exams saying ‘what’s ascending? Or what’s descending as well?’ (Mita)

Such discussion of theme 4 focused on expectations about what learners could do and the appropriacy of suggested approaches

Chloe: *Will they be able to do that instantly? (Pause: 2 seconds) That’s a good idea but you’re assuming that they can already do percentage and fraction amounts.*

Viv: *That’s true*

Chloe: *So I don’t know where your class are at*

Mita: *Yeah yeah*

Chloe: *And whether we want a lesson first that’s just on*

Mita: *Just finding the equivalent?*

There was only very occasional mention of national curriculum levels or students’ current levels of achievement (theme 6) but of greater importance to the conduct of planning meetings were the hinge questions (theme 5), which punctuated the discussion and were used to determine ways forward in relation to the learning challenge:

So will place value then be an important thing? (Sam)

These were also used to advance discussion about approaches or stages of the lesson, for example:

So activate, that's when we need to actually teach it then, isn't it? (Chloe)

The data are rich with detail of how the teachers collaborated in the joint planning of research lessons. However, our view of what constituted their learning from lesson study is confined to analysis of two one-hour planning meetings and film of the two research lessons; we had no accurate record of the additional time involved in the preparation of the lesson, for example working on resources and further interactions of participants (often by email or in incidental conversations reported to us in the end of project interviews). Of course, we heard accounts about these interactions in the end-of-project interviews.

Furthermore, much of the planning discourse in the form of propositions, explanations from past practice, expressions of current shared understandings and clarifications depended on common understandings among the teachers, not always immediately obvious to the post-hoc transcript reader. On the other hand, end-of-project interviews acted as a complement to the analysis of transcripts. From these, we learned that stronger focus on greater student engagement emerged as a result of the collaborative planning phase. The group believed that collaborative planning led them to be more courageous and give greater responsibility to students to manage their own learning, for example, building on initially unsuccessful attempts to measure surface area during the second research lesson (demonstrate phase), described by Chloe in her interview:

We gave them all a cardboard box and they had to work out how much cardboard was used. And I'd never done that activity before and it was actually really good in getting them, because some of them started measuring the sides and adding them together and finding some sort of weird answer of the perimeter of a 3D shape. And

then, we were able to say to them 'well why doesn't that tell you how much cardboard, because it's just telling you a length isn't it'? (Chloe)

Analysis of the filmed lessons confirmed this account and revealed four-part lesson structures (table 3), slightly more complex in the second lesson, but still adhering to the TEEP structure discussed above. Despite adhering to the established lesson structure, participants believed the lessons to be more interactive and less teacher-led than was their norm, as discussed below.

Participants' evaluation of research lessons

Two sets of data were used to access information about the evaluation of the two lessons, analysis of evaluation meetings and of the end of project interviews in which all four participants engaged in reflection on the quality of the two lessons. Unfortunately, the evaluation data were not fully complete due to a technical failure when part of the first meeting failed to record. As a result, we asked participants in the informant-style end-of-project interviews to discuss what had been salient for them in the evaluation meetings.

Insights from interviews

All participants welcomed collaborative evaluation as this was rarely available when traditional observations took place. Despite the focus on learners in the observations, participants reported that they tended to begin discussion about the observed lesson from what Saito, Hawe, Hadiprawiroc and Empedhe (2008, p. 400) would call an 'evaluation minded' perspective rather than 'learning minded', i.e. teacher-focused as opposed to learner-focused dialogue. Interviewees suggested that this was more the case in the first evaluation meeting with stronger initial focus on the effectiveness of the lesson as a teaching event but with reference to students' engagement. One observer's evaluation of the lesson was critical:

Some of it [the evaluation meeting] was practical – kind of did the lesson work on a practical level? So at the end, the activity we planned was just a bit chaotic in the

classroom and so we said you know if you taught that again, we'd just leave that bit out or do it a bit differently, so there was that sort of practical stuff, uhm... I looked through some of their work, Mita [the teacher] collected in all the sheets that they'd done, and so looked through that uhm, and mostly successful, well pretty much entirely successful, so yeah, that was interesting uhm... what else did we do... we just chatted about how our own individual students got on, uhm, and how Mita felt about teaching it and how it was from her point of view as well. (Chloe)

Sam, who was very forthcoming in interviews, elaborated on the kinds of changes needed both in the first lesson and in any future teaching, for example:

We had to amend the lesson, because when they were meant to get into fraction families at the end uhm, we were going to put them all actually in rows, but that didn't really work, uhm so they were going to change that part of the lesson to just actually put yourself in groups – there was the fractions, decimals, percentages and then leave them to get into the group rather than actually having them all lined up in different sections like all the fraction people, all the decimal and all the percentage, like it didn't really work. That's the part we said we'd change

Participants reported that the research lessons represented the first time they had focused so firmly on observing learning in the classroom and the benefits of focusing on a small number of students were frequently mentioned. Observations revealed that students who were judged to be less able took more from the lesson than expected, thus changing teacher perspectives about individual students. The teacher of the first research lesson had drawn up a profile of the students in the group from which the case students were selected during the planning stage:

Well what I did was do a seating plan with the year three members of staff and highlighted who'd go the highest in their group, you know like in terms of levels and

who'd got the lowest, who's easily distracted so that they can pick who they want to focus on (Mita).

In the evaluation meeting, she learned from the evidence of her colleagues' observations of what the students were doing in the lesson that her expectations were exceeded, for example:

.... in that meeting they told me who they'd focussed on and one of the kids I'd said is easily distracted it actually turned out that he was on task the whole time and it was really, uhm, you know.... a nice surprise as well.

All four teachers were surprised and energised by the response of the students in both research lessons. Most significantly, participants could see the effects of their approach on students' emerging understanding, for example:

And ... giving them something concrete that they could play with, that they could cut up, that they could like open it out and see it's something flat, so I think then meant for the rest of the lesson they were like 'ah, this is really straight forward' so I think if you watch the video they'd just be like you do this and then... (Chloe).

There was no questioning of existing approaches to lesson planning, in this case the TEEP model discussed above, but the same teacher confirmed the impact of lesson study on her thinking and in making her pedagogy (co-developed in a collaborative project with others) and the resultant learning more effective:

Whereas if, when I taught that lesson, with the mini whiteboards without doing that box thing first, they weren't getting it all right. So I think what we said is that having something, a very real example, really helps and I guess I kind of knew that already, but it's... it's proof isn't it that we should be doing more of that? (Chloe).

This perception was shared by all participants and was perhaps the most significant formative result from engagement in lesson study.

Insights from evaluation meetings

The second evaluation meeting, of which we had a full recording, was analysed in detail.

Within this meeting, seven major themes emerged following analysis of thematic units (table 4). This section reports in particular on themes 1 and 2: observers' evaluation of teaching/pedagogy and evaluation of students' learning/engagement/progress. Observer and teacher commentaries on the teacher's approach followed by focus on students' engagement and learning represented 57% of the themes.

HERE Table 4: Analysis of second post research-lesson evaluation meeting

When discussing pedagogy (theme 1), the evaluation meeting was characterised by a supportive and inclusive 'we' perspective and expressions about what was perceived to be a successful and eye-opening research lesson:

Mita: *I think that was an excellent lesson!*

Chloe: *Yeah I do.*

Mita: *If I taught surface area again I'd definitely make an effort to have the boxes...
It makes a massive difference.*

Chloe: *I would as well. I'd happily teach that lesson exactly how it is. I think we've
planned a very good lesson.*

The innovation used in the lesson was judged a great success, in contrast to the more qualified success of the first research lesson:

Mita: *The box thing really helped .. and then I think once they'd figured out that
you don't measure the length, surface area is different, then they were able to
apply it to the pictures on the board.*

The same participant at interview claimed that the lesson could be used again to very good effect with no change:

So I was really impressed and it was definitely a lesson that if I was going to teach surface area, I wouldn't do that any differently.

As noted above from the interviews, student engagement and progress (theme 2) tended to surprise participants, as in the following extract:

Mita: *They were literally doing it from the start, just step by step and then it kind of, ah, ok, then you just add it up.*

Viv: *Their understanding was there without you even having to actually do anything, was it?*

The interviews and evaluation meeting transcript talked in general terms about positive effects on pupil progress but occasionally there was more precise discussion about learning that teachers claimed had not taken place in previous lessons. For example, in the two extracts below, the teacher refers back to previous lessons in which pupils had expressed anxiety (ahhh) to indicate uncertainty in their understanding:

Chloe: *..... so judging by their answers they were all like 'well of course it's this' and 'of course it's that'. And when I've taught surface area before that hasn't been the case, they've been like ahhh?*

Chloe: *... and they all got it right and I was like 'oh!' and that's quite a nice surprise because yeah, in other lessons that I've taught that hasn't been the case.*

Chloe also observed that during the lesson an assessment for learning check using whiteboards had revealed that pupils had got the units right, to which Viv replied: *That's really good for that hardly ever happens.*

The group sought to analyse how or why the approaches used had led to this impact on pupil progress, agreeing that the use of real boxes and the preparation time had been significant:

Mita: *Do you think it's the fact they had that box to look at and...*

Chloe: *Yeah*

Mita: *and pull apart?*

Chloe: *... we spent almost half the lesson didn't we, kind of preparing them for surface area.*

Such observations of learning during research lessons led to changes in teachers' thinking about the capabilities of their students who, if given opportunities for practical problem-solving, could and would take responsibility for their own learning. The consensus was that planning had been successful, that impact on students had been positive and the lesson had led to changes both in teacher views about students' level of engagement and in the approaches needed to engage students in effective problem-solving activities. The approach developed for the second lesson had built on the lessons learned from the first research lesson (some criticisms of which are reported above).

Discussion: teacher learning from lesson study

The analysis revealed that planning meetings provided important discursive opportunities for detailed planning and in-depth reflection about the quality of teaching and learning (Lewis, 2009). The evidence about the value of the evaluation meetings was much less convincing. While a quarter of the discussion about the second research lesson was focused on the responses of learners during the lesson, their engagement in the tasks and their progress, the second evaluation meeting acted more as a celebration of success, which boosted teacher morale but offered only limited evidence of detailed critical evaluation. Perhaps engagement in open criticisms might be a threat to face and the focus on celebrating the success of the lessons might be an avoidance of that.

When planning, participants had focused on discussing how the mathematics could be understood before engaging in a search for ways in which the challenges could be addressed, not only to motivate learners but also to engage them in thinking about the mathematics. In line with other research (Stigler and Hiebert 1999; Lewis 2009), we found that discussion focused on helping students to overcome their difficulties. Although there was some focus on teachers' performance in the evaluation of the lesson this was limited. What shaped professional learning in lesson study was a consideration of the difficulties that students encounter with particular aspects of their learning of mathematics. However, when pedagogic solutions or approaches were discussed, these were considered within existing structures for lesson planning, currently recommended by the school's management (the TEEP approach explained above). Analysis of the meetings revealed that TEEP is the *modus operandi* of individual teachers and planning meeting transcripts were organised in relation to stages of the TEEP framework.

The success of the two lessons and insights gained about learners suggest that teachers can benefit even from adapted and less time-rich versions of lesson study than might be common in Japan. Furthermore, analysis of the planning meetings revealed that lesson study can provide a useful vehicle for the collaborative exploration of pedagogy even where a particular approach to lesson planning is expected. Collaboration in lesson study bonded this team together, strengthening the teachers as a community, a perception confirmed by a newly qualified teacher in her end of project interview:

And then we kind of put it all together and I think it kind of bonded us more as friends even, than just teachers. ... I really liked it. (Viv)

Analysis of the planning and evaluation meetings revealed collaboration led to greater willingness for pedagogic risk-taking, leading to lessons that included frequent interactive hands-on opportunities and independent opportunities for learning, in line with the findings of Ylonen and Norwich (2012, pp. 312-313). These successes in terms of collaboration and

perceived lesson effectiveness occurred despite the fact that time given to lesson study was much less than might occur in Japan where a research lesson can sometimes take months to develop. Structured collaboration in lesson study, even in a busy pressured school context, had impacted on views about students' capacity for engagement in independent learning and use of less-teacher led approaches.

If the aim of professional development is to provide structure and time to build teachers' professional capital not just put pressure on individual teachers, then lesson study offers a possible solution. The overriding claim made by participants was that the process had been worthwhile, and had an impact beyond the confines of the immediate lesson. The process offered opportunities for participants to develop individual expertise (human capital in terms used by Hargreaves and Fullan 2012) through collaboration in a community of teachers (thus building social capital) leading to greater confidence to make changes and willingness to take risks (decisional capital). The two lessons provided evidence of teachers' willingness, when working together, to address learning challenges with creative and engaging approaches, suggesting that the project encouraged deeper study of pedagogy through collaborative dialogue. Some change was acknowledged by all participants who particularly welcomed the opportunity to plan collaboratively and observe students.

The capacity-building process of lesson study involves deeper engagement than merely planning a lesson and making resources together. This is where the organisational challenge lies because inevitably it requires investment of time. Unfortunately, lesson study was not maintained or sustained further by either group following the end of the case study, something of a disappointment given its success. Why is it difficult to embed approaches to teacher development such as lesson study? One possible explanation is that attempts to improve teaching are increasingly a 'fast-speed', 'fast-results' process in many educational systems, usually related to individual teacher performance rather than an investment in the quality of teaching overall (Stigler and Hiebert 1999). This neo-liberal turn puts great

pressure on teachers by leading to a ‘performative’ culture (Ball 2003) driven largely by examination outcomes rather than quality of learning. As a consequence, teacher work becomes dominated by short-term output foci rather than the longer term building of capacity and insight (Professional Capital). The focus on performance and the short term has been described as a ‘Business Capital’ approach (Hargreaves and Fullan 2012) which in the long term does not effectively improve practice. The success experienced by teachers in this study suggests that lesson study could stand in contrast to quick-fix approaches to pedagogic improvement. However, the challenge to its use in England is to integrate it into busy school schedules, with adequate time for it to take root and have impact.

Conclusions

The project was intended as a trial of the lesson study approach to examine critically its applicability in an English school, whose system is very different in nature to systems in other countries. Despite some time constraints, the teachers who engaged in enquiry through lesson study reported positive outcomes:

- a) improved understanding of their students;
- b) collectively developed approaches that were less teacher-centred and perceived to offer improvements in the quality of students’ learning opportunities;
- c) creation of a stronger sense of teacher community.

These findings derive from one lesson study cycle over two school terms but highlight a number of issues which warrant further exploration, especially in the light of the success of lesson study in other education systems, for example Japan. The project proved useful in capturing some evidence of what can be achieved by teachers working together in lesson study. While it appeared to have potential as a vehicle for professional development, it also throws up substantive organisational challenges if its use is to expand. How an approach which inspires so much faith in Japan and more recently the USA can be transferred to other

countries requires further exploration, in particular in relation to two procedural and contextual challenges:

- feasibility of including lesson study in a school's professional development programme;
- willingness of participants and senior management teams to invest time to allow lesson study to grow the school's professional capital.

We are encouraged in the belief that lesson study can act as an alternative or complementary model of teachers' learning. However, this can only occur if certain conditions are in place, for example time and management support, as well as freedom from quick-fix expectations associated with what Hargreaves and Fullan (2012) describe as business capital thinking.

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