

## **Lesson study as a Zone of Professional Development in secondary mathematics ITE: From reflection to reflection-and-imagination**

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We here add to the sparse literature on the use of Lesson Study (LS) in initial teacher education (ITE), reporting how LS can mediate development of reflective practice (RP). A cohort of 50 student-teachers, all secondary mathematics postgraduates, were involved in lesson study subgroups: planning, teaching-and-observing, analysing and reflecting on observations, and re-teaching. Each study group worked on their own LS in selected schools with teachers/school based mentors that had some previous experience of lesson study. We tutors/researchers/authors observed the planning, teaching and post-lesson analyses, and one of us interviewed selected participants. Two main findings were: (i) the significance of imagination for reflective practice, here prompted by the focus on improving and ‘re-teaching’ the lesson; and (ii) the importance of the ITE-peer group and its relations with more powerful others (mentors and tutors) to development. We conclude that LS may complement and even ‘lead’ the development of reflective practices of student teachers, providing a Zone of Professional Development.

**Keywords: lesson study, initial teacher education, secondary mathematics, reflective practice**

### **Introduction**

Preparing teachers to learn from teaching, through critical reflection on their practice, is one of the main skills to develop during initial teacher education (ITE) (Hiebert, Morris, Berk and Jensen, 2007). The capacity to learn from teaching has been described as a meta-competency, which fosters the development of many other teaching competencies (Collins and Karsenti, 2011). However, despite its relevance in teaching practice and, therefore, its centrality in teacher preparation programmes, there is a lack of explicit guidelines on how to teach reflective practice (RP) (Russell, 2005). Some propose teaching explicitly, directly, thoughtfully and patiently modeling their own use of reflection-in-action (Russell, 2005). Others underline the importance of building ‘reflective communities’ (Beattie, 1997), moving beyond individual activity to communities of inquiry that nurture teachers’ practice.

Lesson study (LS) is a means of collaborative teacher professional development that originated in Japan (e.g. Fernandez and Yoshida 2004). In the last 10 years LS has become increasingly popular internationally, especially in the US (Hart, Alston and Murata, 2011). This has led to theoretical models (Lewis, Perry and Hurd, 2009) and adaptation in different contexts (Fernandez, Cannon and Chokshi, 2003). Although this has informed continual professional development (CPD) for in-service teachers, adaptations for ITE are relatively rare. This paper presents results from a LS experience, in the context of ITE for secondary mathematics teachers (PGCE) in the North West of England. The main goal of this study is to explore how the LS process can support students’ development of reflective practice.

## Background

Teaching could be described as a ‘messy’ and ‘ill-defined’ practice (Dewey, 1933; Schön, 1987). In this context, teachers’ capacity to think about what happened during a classroom lesson, why it happened, and what could be done next time to make it happen more successfully - commonly referred to as RP - is central (Osterman and Kottkamp, 2004). Schön (1983, 1987) has been one of the most influential writers on RP. He proposed (1983) that, in order to improve some aspect of practice (what he calls tacit knowledge or *knowing-in-action*), reflection is needed. He distinguished two components of RP: looking back after an event (*reflecting-on-practice*), and modification of immediate actions (*reflecting-in-practice*) (Roth-McDuffie, 2004).

Although there is agreement on the relevance of RP for teaching, it is still not clear how best to help novice teachers engage in productive reflection. Novice teachers are easily distracted by practical lower-order skills, such as ‘managing students’ behaviour’, and have a tendency to describe rather than identifying reasons for success (analysing) (Parson and Stephenson, 2005). Some of the agreed conditions for productive RP in ITE are derived from conceptions of teachers’ learning as situated (e.g. Putman and Borko, 2000) and as a social practice (Hoffman-Kipp, Artiles and López-Torres, 2003). First, learning to reflect should be grounded in authentic practical activities (Putnam & Borko, 2000), as ITE students have limited previous experience. Combining school-based tasks with scaffolded reflection allows student-teachers to experience innovative classroom/school practices that avoid automatic enculturation into and reproduction of traditional norms of the teaching profession (Zeichner and Tabachnick, 1981).

Second, RP - as for any other higher order skills or competences - is best learnt collaboratively (Hoffman-Kipp et al., 2003), with ITE students benefiting from the assistance of others (peers and those more expert) in joint activity. This collaborative approach has been considered in ITE models that include peer collaboration, for instance, ‘paired teaching placements’ (Nokes et.al., 2008) and ‘critical partnerships’ (Parsons and Stephenson, 2005), and more horizontal collaboration between mentor and student, where they plan, teach and evaluate together (Charlies et.al., 2008).

Finally, bridging theory and practice (praxis) and focusing on pedagogical aspects must take precedence over pragmatics and everyday operations (Hoffman-Kipp et al., 2003). However, mentors may lack confidence when talking about pedagogy (Roth-McDuffie, 2004) and in the current performative culture operational aspects of teaching dominate school institutions (Williams, Ryan and Morgan, 2013).

LS provides a model that considers all of these conditions. It is pedagogically focused on designing, implementing and discussing an authentic lesson through a collaborative approach. In the LS cycle teachers collaboratively plan a lesson, observe and gather information about students’ learning, and analyze, reflect and discuss these observations (Fernandez and Yoshida, 2004). Importantly in the model practiced here, they imagine and agree improvements or refinements and re-teach the hypothetically improved lesson.

One of the few examples of using lesson study in ITE is reported by Fernandez (2005; 2010) who led a group in the US exploring the use of LS combined with micro-teaching (MLS). In MLS, groups of student teachers teach a small group of classmates. They found that prospective teachers learnt through active engagement in a collaborative environment (Fernandez, 2010), found it easier to connect theory to practice (Fernandez and Robinson, 2006) and used a knowledgeable advisor’s

formative feedback to develop a critical perspective (Fernandez et.al., 2003). In our model, however, the students meet with teachers and teach in classrooms: we anticipate important differences.

In real classrooms few examples were found in the preparation of elementary school teachers. Murata and Pothen (2011) found LS was a useful way of relating university-based and in-placement activities. Yu (2011) found that LS could help to avoid enculturation into traditional norms of the teaching profession (Zeichner and Tabachnick (1981)). However, some student-teachers experienced teaching the research-lesson as stressful (Murata and Pothen, 2011), and tutor guidance was needed to maintain focus on higher level skills and competences during the post-lesson discussion (Fernandez and Zilliox, 2011).

In the light of this evidence, we designed an intervention that allowed collaborative reflection and interaction between student-teachers, in-service teachers and university tutors, and was school-based. During the academic year of 2011/2012 we piloted a LS process with in-service teachers and student-teachers whilst on placement in a number of partnership schools through a small funded pilot (AGGS, 2012). In each school up to three LS cycles were completed. The pilot aimed to bring together a process of CPD and ITE and was focused on mathematical dialogue. Although this experience was very successful in terms of CPD and in-service-teacher engagement, student-teachers had a relatively peripheral involvement in the process. In many schools the student-teachers did not teach and were observers rather than active participants in the planning and discussion meetings. Following this experience we wanted to increase ITE student involvement whilst maintaining experienced teacher participation. The LS focus was again the use of dialogue to develop mathematical understanding, but the plan was: 1) The school selects a lesson topic (suitable for a dialogic approach); 2) A group of five student-teachers plan the lesson with tutor guidance; 3) The entire group (five student-teachers, school-teacher and university tutor or researcher) meet in school to discuss the planned lesson; 4) The school-teacher teaches the lesson, with the group observing students' learning; 5) The group discuss the lesson and modify the planning; 6) The school-teacher leads the new lesson with the group observing; 7) Final discussion of the entire group. In this paper we report results of this experience, focusing on two research questions: 1) How can a lesson study cycle mediate ITE reflective practice? and 2) What contexts favour/hinder the student-teacher reflective process?

## **Method**

### ***Implementation***

The entire LS process happened during January 2013 in five schools and in one school in June. We worked with six partnership schools (some had been involved in the pilot), having different levels of involvement, especially of the classroom-teachers. In most of the schools (four) school-teachers' participation in the planning meeting was limited and they did not lead the teaching of both lessons of the cycle, which was done by the students or tutors. Whilst they gave feedback in the post-lesson discussion the teachers mostly did not contribute to decisions about changes to the lesson plan. In the other two schools, the teachers taught both lessons and were active participants in the planning and post-lesson discussions.

### ***Data collection and analysis***

For data collection purposes, we adopted a case study approach of the PGCE LS experience, comparing its particular contexts of application (schools) (Yin, 2011). Data collection was made during and after the lesson study cycles. The information gathered during the cycle was used in the post-lesson discussions, and as triangulating data for the research. It included two observation schedules and audio recordings of lessons and post-lesson discussions.

After the lesson study cycle was finished, student teachers and teachers who participated in the experience were interviewed, individually or in groups. Two focus groups comprising five student teachers, and five individual interviews with teachers and student-teachers, were conducted. The purpose of the semi-structured interviews was to gather perceptions of the lesson study experience. The interview protocol included questions about implementation, assessment and the extent to which lesson study was new or similar to other ITE experiences.

The analysis of the data included thematic analysis of interviews for eliciting how lesson study can mediate student-teachers' RP; and comparative sub-case studies for eliciting what contexts favour/hinder RP. For the thematic analysis, relevant extracts from the audio recordings were identified and transcribed. The data was analysed, coding interesting features and organising into potential themes (Guest, MacQueen and Namey, 2012).

In order to compare the different contexts we developed a case description of each sub-case (particularities of the implementation in each school). We used a holistic narrative approach (Stake, 1995), maintaining the coherence of each context. In addition we analysed evidence of developing RP in these different implementation contexts. An emerging priority/focus was the development of different roles in the post- and pre-lesson discussion.

## **Results**

### ***Mediation of Reflective Practice by the Lesson Study cycle***

In the interviews, student-teachers said they found the collaborative planning difficult and not very effective. Most groups discussed what they might do and shared the planning work. Some had a group-leader, who wrote up the plan and collated the resources, often acting as the main contributor to the lesson. In addition to these difficulties, some groups failed to select tasks suitable for developing mathematical dialogue, which was meant to be the main objective. Student-teachers were more concerned about 'getting a lesson-plan together' rather than considering how to promote mathematical dialogue. As one student said afterwards:

The activity wasn't good for discussion. It should have been more investigative to bring more discussion between the students. A lot of the things that we were teaching were either...it seemed more black and white, it was this or that... whereas, if we'd done an investigation it would have brought more discussion..

Despite these difficulties, working on the plan led to a sense of ownership. In all the interviews student-teachers talked about 'our' lesson, and 'our' changes to the plan. They valued being 'the only ones finalising the plan', in charge of bringing together their own evaluation with school-teachers' and tutors' feedback.

In contrast, all of the interviewed students said they valued and found easier the post-lesson discussion as a context for developing reflection about practice:

I think reflecting with other people is useful, because, especially when you're teaching, you kind of have like blinkers on, (laughs) and you see one kind of thing, and if someone else is stood at the back or took another part of the lesson, what they see may be different to what you thought you did (...) And discussing as a team helps to process it more, discussing it.

The reflective process at first was focused on concrete and specific aspects of the lesson experience, using observation evidence and the audio recordings to help focus on classroom dialogue:

We had opinions about things, but they were supported by things we noticed during the lesson, so we could convince everyone at the table, 'Look, we have ten critical points in this part of the lesson, we could make that activity longer to see if we can get more critical points'.

And you also forget things, because when you're teaching, it all goes so fast, so that's why the people recording was good, because we could look at it and because it is written down, just like a little reminder.

Subsequently, student-teachers used these observations to improve the plan for re-teaching. The student-teachers' roles as observers and analysts was strongly influenced by the goal of improving the lesson. They used the information they gathered to 'think otherwise', an aspect of the experience they valued greatly. It was important to the process of reflection that the students were encouraged to imagine alternatives, and that the re-teaching of the lesson was the crucial motivation for this re-thinking. They commented that improving a lesson was a unique opportunity:

I enjoyed it, because if you're in teacher training you never have the chance of teaching the same lesson 'til the next year. If I'm teaching one lesson today, that lesson I can't improve it 'til next year, when I get to teach it again. So it is good to teach a lesson once and then, here are the changes, we'll teach it again within two to three days to see the improvements. So I liked it, I liked that (...) I found it very, very powerful, to think about what worked, oh, yeah, I'll try that. Whereas, we reflect on doing something differently, but you can't teach that same lesson again 'til next year (...) and you won't remember what went wrong, unless you'd changed the resources straight away.

Although student-teachers recognised and mentioned dialogue as the main focus of LS, it wasn't always the main focus of their post-lesson discussion. For instance, when analysing recordings of post-lesson discussions dialogue was not mentioned until the school-teacher or the tutor prompted the student-teachers. The student-teachers noted that the tutor guided the discussion to the LS focus:

There was a little bit of a disagreement... I think some people were of the impression that we were discussing teaching style, so recommending improvements for the teacher and how they could have led the lesson better or the task could have been improved (...) but XX [the tutor] kept coming back to dialogue and what that meant in the classroom.

### ***Different context, different collaborative practices***

Two main contexts of implementation were observed in this LS experience: schools where class-teachers taught both lessons of the cycle and schools where school-teachers had less involvement. In the former the student-teachers valued observing an experienced teacher and focussing on the effectiveness of the lesson:

It was really nice to improve the lesson, and because we weren't teaching the lesson, we were just observing, we could pay a lot more attention to what was going on. And because when I do teach I don't usually pay attention to which part

was weak or strong in the plan. But because that was all what we were doing, it was brilliant.

The student-teachers developed a more ambitious lesson plan than if they were to teach the lesson, thus facilitating reflection on planning and teaching separately:

It took all the stress out of the lesson plan (...) so we were more ambitious in the lesson planning (...) And I really appreciated it because I got the opportunity to see an experienced teacher carry out my lesson plan. Because that had never happened before. Previously I worried that my lesson plan was let down by my teaching or that my lesson plans were letting down my teaching, one way or the other, because I knew they relied on each other. I just wasn't sure which one was the weak link.

In the schools where teachers had less involvement, student-teachers found it more difficult to reflect on the implementation of the lesson:

I was teaching it, and when you're teaching you don't actually have much opportunity to realise what is happening, so just with listening to someone just reading the highlights of the class back to you it is nice, and to have the chance to discuss that with a group, I think it is very effective.

In these schools participation in post-lesson discussion was unequal. In one school the classroom-teacher dominated the discussion giving his opinion of the lesson and answering questions about his teaching practice. No decisions were made about modifications to the plan whilst this teacher was present.

Where the teacher was involved in the entire process and taught both lessons, the post-lesson discussion was more distributed. Both, student-teachers and school-teacher gave opinions, commented and elaborated on each others' contributions and asked for information about others' observations. The discussion ended with agreeing changes to the lesson plan and sharing responsibility for making those changes.

The interviewed teachers that did not teach the lesson attributed this to their limited involvement in the planning of the lesson:

This time, (i.e. this year) again, I wasn't involved in the planning, I just sort of saw the plan before, in the lesson I was watching people, but I didn't have a role. I was just sort of supervising and giving sort of general feedback, on how the lesson went. Yes. So I didn't feel I was involved in the lesson study.

Even when the classroom-teacher did teach one of the lessons, the lack of involvement in planning did raise implementation challenges:

If I'd thought about it more, if I'd had more time, I would have had sort of a better story to go with everything of what we were doing

However, the teachers that committed with the entire cycle saw their limited involvement in planning as a strength of the process. They valued the opportunity of trying different approaches and challenging 'their ways'.

Well, as a teacher I think you get quite set in your ways and I think is nice that you're coming, and say "try this", and we may try it and it may actually work really well, so I'm quite happy to try it, even though it is a little bit out of my comfort zone - that what I usually do, I think it is quite nice to try it, and if it goes well, keep it for the second lesson, and if it doesn't, I may do what I normally do.

## Conclusion

The structure of LS can contribute to the professional development of ITE students, particularly the role of imagination in their RP. Whilst collaboratively planning the initial lesson was difficult, it had a major role in developing ownership of the lesson.

Students' and tutors' comments suggest that, in order to develop a more productive reflection in this early stage of the LS cycle more guidance in reflecting/imagining from experienced teachers is needed. Then the students were committed to analysing and improving the lesson, taking responsibility for bringing together contributions from peers, teachers and tutors in re-imagining and re-engineering a hypothetical improvement. We argue that this role of imagination in reflecting on practice (after the lesson) is crucial to the students, and that the re-teaching in lesson study may play a vital developmental role in this (Schon, 1983).

Thus the post lesson analysis and imagination of improvements was instrumental in developing ITE students' RP, adding a new highly relevant dimension to their 'zone of professional development'. This explains and supports previous findings on the relevance of 'repeated cycles' in LS with ITE students (Fernandez, 2010).

Finally, the implementation of LS was mediated by the social relations between those involved. In this case student teachers, university tutors and in-service teachers worked together with a view to improving their practices. When classroom-teachers were involved in the entire process, the distribution of roles within the post-lesson discussion were more equal: student-teachers and school-teachers contributed opinions about the lesson and possible changes to the plan. Where the classroom-teacher was less involved, a power imbalance was evident and the student-teachers were not able to contribute their opinions of the lesson on equal terms. Following this we conclude that engaging the participants in equal terms, sharing their roles and experiences, helps in providing a collective experience of LS. This collective experience is what we suggest provides more adequate opportunities to learn, which we refer to as a Zone of Professional Development. The challenge for the team and a relevant area of future research is how best to facilitate this.

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