

## The Discipline of Noticing as a Path to Understanding: Researching from the Inside

Yvonne Barnes and Yvette Solomon

Pre-print version of: Barnes, Y. & Solomon, Y. (2013) The Discipline of Noticing as a path to understanding: researching from the inside. *International Review of Qualitative Research* Vol. 6, No. 3, Fall 2013, pp. 360–375.

### Abstract

This paper explores the application of the ‘discipline of noticing’ in a UK-based teacher development programme designed to enable primary school teachers to develop a deeper understanding of their pedagogical subject knowledge within mathematics, primarily through researching their practice and developing a critical reflexivity. The researchers involved in this study focused on ‘noticing’ as a support for ‘researching from the inside’, in which the practitioner records microincidents in the classroom which have particular salience for them. Subsequent reflection aims to facilitate a drawing back from immediate practice and enabling teachers to see things they have previously overlooked, or have become habituated to see. Focusing on a case study of one teacher participant, this paper explores how the discipline of noticing enables the development of a ‘third space’ in which teacher and researcher roles become hybridised. We argue that teacher empowerment and change is sustained within and beyond the researched context through an emergent participant perspective which enables context-sensitivity and a response to learner identities and local knowledges in the pursuit of particular social justice concerns.

**Keywords:** continuing professional development; mathematics education; discipline of noticing; researching from the inside; social justice; third space; research in praxis; agency; identity

### Introduction

While a benign view of the concept of continuing professional development (CPD) assumes that access to communities of professional enquiry and discussion cannot be anything other than a good thing, the reality of CPD in the current educational policy climate in England is

rather different. Driven by demands for increased ‘performance’ in a knowledge economy, CPD is shaped by a ‘one-size-fits-all’ assumption that ‘what works’ in one school context will be successful in any other, and, moreover, that there is a consensus about what ‘working’ entails (Farnsworth & Solomon, 2013). This is very clearly the case in mathematics education, where international tests such as TIMSS and PISA set the benchmark for what is considered to be good learning, fuelling government concerns with perceived underachievement and contributing to blanket ‘national strategies’ for improvement. Meanwhile the research community argues that mathematics and its learning are context-sensitive practices, from which some groups are consistently excluded as their learner identities and local knowledges are ignored (see Solomon, 2009, for a review and critique).

Access to the powerful knowledge that is mathematics is a social justice issue, and as we shall see this concern drives Louise, the teacher at the centre of this paper. However, the kind of change in practice that Louise needs to make to achieve her goals is not one that can be prescribed by ourselves as researchers looking on, still less by a top-down CPD strategy of ‘tips and tricks’. We will argue here that the potential for real change comes about through dissolution of the practitioner-researcher boundary and the development of a methodology of ‘researching from the inside’ – what Kemmis (2012) calls ‘researching practice from within practice traditions’ (p. 885). Arguing for the adoption of the term *praxis* rather than *practice*, Kemmis suggests that the traditional ‘spectator’ education research mode and emergent participant perspectives are complementary, offering the opportunity to take a dual approach that allows a collective transforming praxis. Blending ‘the view from within and the view from without’ (p. 901) enables the development of research that emphasizes the social justice aspects of education as a human good.

To explore the potential for CPD as a basis for researching praxis from within, this paper focuses on one local presentation of a government-funded programme designed to

address perceived inadequacies in English primary school mathematics teaching by creating ‘maths champions’. These would be classroom teachers who would manage change in teacher subject knowledge and pedagogic skill in their own schools, as recommended in the government-funded Williams Report (Williams, 2008). The paper builds on our previous research exploring the impact of the programme on primary school teachers’ practice in which we have focused on troubling assumptions of how we ‘measure’ and understand ‘what works’ in CPD. Our first analysis of this issue (Barnes, Cockerham, Hanley, & Solomon, 2013) sought to establish how CPD participants developed and maintained their teacher professional identity despite conflicts between the programme ‘ideals’ to which they aspired and the context of performativity in schools in England. We argued that evaluating the success of CPD requires going beyond simple measures of changes in practice, replacing this with a focus on how participants theorise their use of new approaches in their particular school context. This led to an emphasis on the CPD programme as a site for the development of tools for critical reflection on pedagogical practice. We explored this idea further in Barnes and Solomon (2013), arguing that the programme provided participants with a ‘language of description’ which enabled them to articulate and reflect on their practice and make active pedagogical choices. In the current paper, we pursue the methodology underpinning critical reflection as a practice, focusing on the ‘discipline of noticing’ (Mason, 2002, 2011) as a support for ‘researching from the inside’. We explore the extent to which ‘noticing’ – drawing back from immediate practice to see what one has previously overlooked or become habituated to see – is sustained within and beyond the CPD programme by looking in detail at Louise’s mathematics teaching after she had completed the programme. In what follows, we examine how her reflections and choices develop as she understands particular concepts, behaviours, and pedagogies from different perspectives. We argue that the process of researching from the inside facilitated a move into a ‘third space’ (Gutiérrez, Baquedano-

López, & Tejada, 1999; Williams & Ryan, 2013) characterized by the hybridisation of the roles of practitioner and researcher. In this space, Louise enacts Kemmis' research in praxis, exercising agency and choice as she experiments and challenges existing pedagogical practice, impacting practice at a classroom (micro) level and also at a strategic whole school (macro) level.

### **The Methodology of Noticing**

Introduced in 2010 as part of a national initiative to raise the standard of mathematics teaching in English primary schools, a version of the Mathematics Specialist Teacher (MaST) programme was developed by teacher educators at Manchester Metropolitan University (MMU) which had the explicit aim of enabling teachers to critically assess and construct pedagogical practices for their own settings. We took the opportunity provided by government funding to expand the possibilities of CPD. Unlike many instructional CPD programmes, the MMU MaST initiative requires participants – established practising classroom teachers – to undertake small research projects within their own schools and to reflect on their experiences of teaching investigative mathematical tasks during the programme sessions. Assessment requires participants to incorporate critiques of research literature into their reflections on children's learning and their own teaching practice in two pieces of written work at the master's level. Thus the programme structure, in which practitioners act as researchers, identifying, reflecting, and reporting back on problems within their own context, provides an opportunity for teachers to practise the act or discipline of 'noticing' (Mason 2002, 2011) as a research methodology.

*Noticing Multiple Definitions and Multiple Methodologies*

As Sherin, Russ, and Colestock (2011, p. 79) point out, the complexity of the classroom is such that teachers inevitably *make choices* about what they attend to in directing their own behaviour. They cannot attend to everything; they must focus. While it might be suggested that many such choices may not constitute ‘noticing’ in the sense of being conscious or directed, we argue, with Leont’ev (1978), that there is no activity which is objectless. On the contrary, activity is formed in interaction with the environment and the goals it generates and is, in this sense, a ‘choice’, although it might not be understood as an explicitly reasoned choice. The discipline of noticing underlines the role of active reflection on what is noticed and why, its interpretation, and consequent action. In defining noticing, however, researchers vary on what they include as noticing, incorporating one or more of van Es and Sherin’s (2002) components:

- (a) identifying what is important or noteworthy about a classroom situation; (b) making connections between the specifics of classroom interactions and the broader principles of teaching and learning they represent; and (c) using what one knows about the context to reason about classroom events. (p. 573)

Thus some researchers are only concerned with what teachers see and don’t see, others include teachers’ interpretations of the noticed activity, such as how they make sense of the event on the basis of their knowledge about the student and about the concept being taught, while others still include the way the teacher actually responds to the event.

These approaches vary also in terms of how the teacher is positioned in the methodology of noticing. In concerning themselves with what teachers do or do not see, Star, Lynch, and Perova (2011) focus on how watching public release video from the TIMSS study (TIMSS, n.d.) can be used to support the noticing ability of trainee teachers so they are able to identify salient or noteworthy features when observing classroom teaching – that is, how

their noticing could be *improved* in accordance with criteria set by the researcher and in accordance with the following observation categories:

Classroom environment – physical setting, equipment, demographics, grade level

Classroom management – classroom events, including disruptive events, pace changes, and procedures for calling on students

Tasks – the activities the students do during the teaching episode

Mathematical content – the maths of lesson including representations such as examples used, models presented by teacher, problems posed

Communication – communication between students or between students and teacher including questions posed and answers or suggestions offered (adapted from Star et al., 2011, p. 121)

Star et al. (2011) report that following their intervention, trainee teachers' noticing skills improved in certain areas, notably classroom environment and classroom management, with some improvement in the category of communication. However, there was no improvement in noticing of task features or mathematical content, both important events but 'inherently harder to notice' (p. 131). Unable to distinguish between important and less important lesson features, '[trainee] teachers' attention will be attracted by whatever is most visually salient, obvious, or personally compelling – independent of its importance in the lesson' (p. 132).

Significant features of this approach in terms of how the teacher is positioned include the facts that the lesson watched is not their own and that the researcher stands outside the process and decides what is and is not important. Other researchers focus more on teachers' interpretations which, significantly, Sherin, Russ et al. (2011) call 'noticing as *professional vision*' (p. 80). Noticing is recognised in their approach as filtered through the teacher's understanding of particular classrooms and what they know of particular students – thus understanding noticing cannot proceed from the observer's point of view alone but must include the teacher's. Sherin and van Es (2009) asked teachers to work in peer groups to watch and discuss video recordings of their teaching. They report that video clubs have an

effect on overall teacher professional development which extends beyond the duration and scope of the club itself, thus positioning the teacher as the subject rather than the object of the intervention.

The use of head-mounted camera technology by Sherin, Russ et al. (2011), which enables the wearer to record selected moments within their teaching, further foregrounds teachers' interpretations and reflections in connection with 'in the moment' noticing. They were asked to describe why they had chosen to record particular clips, whether the clips gathered during the day represented what they had intended, and what criteria they were aware of in their choices. Their responses led Sherin Russ et al. (2011) to argue that they possess an 'awareness of awareness' (Mason, 1998), recalling moments and their accompanying thinking with ease. Sherin et al. found similarities with other research in terms of what was noticed – student thinking, teachers' thinking, communication, and classroom environment. Most commonly events were captured because they were 'surprising' – in terms of student participation or the mathematics ideas raised. That is, these were deviations from expectations. Other events were captured precisely because they occurred as expected and aligned with teacher expectations. Thus, Sherin, Russ et al. argue teachers' noticing is 'driven by continuous tacit comparisons to their expectations' (p. 90) and so is deeply embedded in their existing professional practice or 'practice architectures' (Kemmis, 2012) and the normative 'teleoaffective structures' which link the 'doings and sayings of a practice' (Schatzki, 2002, p. 80) .

Jacobs, Lamb, Philipp, & Schappelle (2011) take what Sherin, Russ et al. (2011) consider to be 'an even more inclusive view of teacher noticing' (p. 80), incorporating teachers' planned responses into their definition of noticing. In tune with our approach in Barnes et al. (2013) and Barnes and Solomon (2013), Jacobs, Lamb et al argue that CPD needs be understood as building on teachers' existing perspectives and that a focus on

noticing can provide tools which teachers themselves can use beyond CPD itself. Extending teacher noticing to a further phase – that of generating new knowledge – Santagata (2011) presents the case for seeing the teacher as exerting professional agency in noticing. In her CPD intervention, teachers were required to focus on alternative strategies, ranging from the rephrasing of teacher questions to the redesign of an instructional activity. Taking issue with the approach suggested by Star et al (2011) and Sherin, Rouss et al (2011), Santagata argues that

what one notices and the kind of reasoning one performs on what one notices are interrelated processes. That is, when one's purposes for noticing go beyond the intellectual exercise of studying teaching, or teachers' conceptions of teaching, and include reflection on teaching guided by the goals of learning from it, the two processes—attending and reasoning—inform each other. (p. 156)

Importantly, the phase of generating new knowledge and new strategies involves teachers in forming hypotheses which they can test in their classrooms, a notion reminiscent of Stenhouse's (1975) definition of a curriculum as a hypothesis about knowledge put to the test of practice.

Santagata's (2011) disagreement with Star et al. (2011) And Sherin, Russ et al (2011) reinforces our position on the role of teachers in the methodology of noticing. In what follows, we take these ideas forward to explore the potential of noticing as providing a 'third space' (Gutiérrez et al., 1999) in which the teacher enacts a hybridised role of practitioner and researcher, generating and testing hypotheses relating to their own practice. Building on Kemmis (2012), Reid and Green's (2009) emphasis on researching from the practitioner standpoint, and Torrance and Pryor's (2001) investigation of a collaborative action research approach to professional development, we will argue that noticing as 'researching from the inside' is a concept to be taken seriously in assessing the impact of CPD. Additionally, we will suggest that the emphasis on micro-noticing as an ideal in the discipline of noticing (see



for example van Es, 2011 is open to question once we have opened up the third space of the practitioner-researcher and the possibility of ‘macro-noticing’.

### **Noticing Noticing: A Case Study**

In the remainder of this paper, we present the case of Louise, a deputy head teacher of a large primary school in the North-West of England, where approximately two-thirds of pupils are of minority ethnic heritage, predominantly Bangladeshi. Many of these pupils speak English as an additional language and the proportion of pupils eligible for free school meals is well above average. Louise was part of the first cohort of MaST participants who began the programme in early 2010 and was first interviewed in 2011 as part of our early research on MaST impact (see Barnes et al., 2013) and then again in late 2012, approximately 12 months following completion of the course. The initial interview, conducted at the university by both authors, explored her perception of changes in her teaching practice as a result of participating in MaST, her general feelings about teaching mathematics, and obstacles and support in relation to mathematics teaching in her particular primary school context. The second interview took a different form, being based around discussion of Louise’s Year 4 (ages 8–9) mathematics lesson, which was observed and videoed immediately preceding the interview. The observation and interview were conducted by the first author, a tutor on the MaST programme and well known to Louise as a fellow professional and practitioner. The interview itself focused on Louise’s reflections on the lesson, prompted by looking at video extracts from the lesson itself, and also followed up issues raised in the initial interview, particularly in relation to the teaching of mathematics to girls. We were also interested in whether Louise had continued to ‘notice’ and critically reflect on the various aspects of her practice and whether the process of ‘researching from the inside’ had been sustained and was continuing to impact on her pedagogy and the mathematics curriculum.

### **Analysis: ‘Researching from the Inside’ as Situated Action**

In presenting the data in this paper we must be necessarily selective. Our strategy therefore is to map Louise’s journey towards a practitioner-researcher who ‘researches from the inside’ and is ultimately able to develop her own socially situated research agenda and methodology. We focus primarily on a particular issue that Louise herself raised in her first interview: a concern with girls’ engagement with mathematics. Our analysis is informed by van Es’ (2011) framework of the move from baseline noticing, through mixed and focused noticing, to extended noticing; Jacobs, Lamb, and Philipp’s (2010) emphasis on response; and Santagata’s (2011) framework of asking questions, hypothesising, and testing.

#### *Initial Interview (2011) – Working at the Baseline*

In her initial interview, Louise described how she had applied investigative pedagogic concepts from MaST and was noticing aspects of her practice. She appeared to be working at a baseline noticing level that considered children as a group or subgroup (Jacobs et al., 2010; van Es, 2011), as demonstrated in her interest in one group of girls who she felt were making ‘slow progress’ in general. She incorporated this into one of her MaST assessments:

I did my assignment on girls . . . girls and maths, because there’s a group of girls currently in year 6 that haven’t made any progress . . . well very, very slow progress at the end of KS1 [Key Stage 1 of the English National Curriculum: ages 5–7] to the end of KS2 [ages 7–11]. . . . So for my assignment, I delved deep and did a lot of interviews with the girls and tried to find out why.

Louise’s analysis of the problem focused on general gender characteristics, including lack of confidence and a perception of mathematics as being for boys (‘whenever I asked them who was the best mathematician in the class, they related it back to it being a boy’), and on macro-

level school practices, which contributed to the girls feeling ‘pressured’ during mathematics lessons.

In the pupil progress meetings . . . a lot of the children we were talking about that weren’t making progress were quiet girls and people, staff, were saying ‘Oh, it’s their confidence’ and we were accepting that as an SLT [i.e., the Senior Management Team], as a reason. So I just wanted to delve deeper, is it the confidence or is it . . . is it something else? And it’s come back to the fact that yes, it is confidence, but it’s . . . because of the practices and procedures that we’ve got in the school.

Again, the practice and procedures issues were reported on at a global level:

They did like maths, but they felt under pressure, they needed more time. And there was this big perception with the girls about the group that they were in, they felt that they were in a lower group because they were no good at maths. And when you delve deeper, it came down to how the work was presented, they knew they were different because they were doing easier work to everybody else.

Louise’s subsequent strategy was to teach this group of 12 girls separately from the rest of the class.

I’ve withdrawn those girls from the maths lessons and I’m actually teaching them as a group of girls [on the basis of] what I’ve learnt from the assignment. And so far, I can see a really positive impact on that and I think that when I go back into class in September, my practice will be completely different.

She had also created a special ‘mathemagician room’ for these lessons to increase the appeal of mathematics for the group.

I’ve got a little mathemagician room now . . . it was for those girls, I just needed to do something to change their perception . . . I just thought ‘Oh, a mathemagician, right’, so I’ve got this like sign on the door ‘Welcome to the mathemagician room’ with wands and things and then we’ve got like witches hats and wands floating through the air and sticks.

Louise was aware that what she had noticed had influenced her teaching, although she was working on what appears to be a baseline level of noticing, making quite generalised

statements that considered children only as a ‘group’, with no specific evidence provided to support the assertion of change regarding either individual children’s understanding or her own teaching.

Doing the research into the girls has really . . . I think that affected my teaching style as well . . . and I’ve become more aware of how I learn and being careful of how they learn . . . it’s just finding different . . . different ways of doing it. So it really is having an impact on teaching . . . and learning.

However, despite her generalised noticing at this stage, we would draw attention firstly to Louise’s emphasis on responding to the problem that she perceives, and, secondly, to her questioning and hypothesising stance in generating that response. While her research approach in terms of testing her intervention is itself generalised, we can see here the beginnings of Louise’s move towards a hybridisation of practitioner and researcher roles, a theme we return to in the next phase of analysis.

*Lesson Observation and Second Interview (2012)*

The main focus of the lesson was ‘using mental methods to add numbers together quickly’. Children were to work in pairs and generate an addition calculation by repeatedly throwing a dice. Louise had placed ‘success criteria’ on the interactive white board that supported this focus and required the children to look for and employ the strategies below when undertaking their addition calculations:

I can look at a calculation and decide:  
 Is there a number bond to 10 or 20?  
 Is there a double number?  
 Is there a near double?  
 I can decide which will be the most efficient strategy to use

As in our analysis of the initial interview, we draw here on established analysis frameworks to determine shifts in noticing from the generalised to the more specific. However, we also introduce here the idea of ‘macro-noticing’ to capture the act of noticing which is ‘big picture’ rather than micro-level but is nevertheless detailed in terms of Louise’s approach as a hypothesis-tester, as well as the evidence she brings to bear on her own analysis.

### **Researching from the Inside: Micro-noticing**

The lesson observation, and Louise’s follow-up comments on what had happened, suggest that she had shifted from her earlier generic descriptions of pupil learning towards a more detailed, ‘focused’ noticing that considered individual children’s understanding of particular concepts and strategies. For example, in attempting a calculation of  $8 + 4 + 3 + 7 + 6$ , one pair of girls had not employed any of the strategies described above but had drawn a series of small circles (dots) on their whiteboard. They then proceeded to count each circle. Louise approached the two girls and provided further guidance for them, reminding them to look for number bonds, which they began to do in subsequent calculations. At the end of the lesson Louise chose them to feed back to the class and share their strategies. In the interview she commented:

The two girls with the dots – I deliberately picked them – because I noticed that they were using dots and I wanted them to know that they had done really well by moving from dots . . . that’s why I chose them to explain.

She also recalled what she had noticed about other strategies that individual children were using:

They had made mistakes and one little girl had gone for  $9 + 1$  and  $9 + 1$  and she hadn’t spotted that she had two lots of number bonds to 10. She had done  $9 + 9$  and  $1 + 1$  . . . and arrived at the wrong answer. So I went back over and said, ‘Is that the quickest way?’, and she spotted what she had done.

Louise thus appeared to have shifted from making generalisations about children as a group and had started noticing at a more detailed level in terms of individual children's mathematical understanding, thus moving beyond the 'one size fits all' assumption of much CPD. Like Sherin, Russ et al.'s (2011) videoed teachers, she was able to recall with ease pertinent moments from her lesson with little or no reference to the video, which was available and shown to her during interview. She appeared to be conscious of what she had noticed and why and could be said to possess an 'awareness of awareness'.

### **Researching from the Inside: 'Macro-noticing' Within the Classroom**

Alongside the shift to more focused noticing as evidenced in the lesson observation and her commentary on it, we also noted that, in her interview comments, Louise was concerned with macro-level issues of classroom organisation which were supported by detailed evidence from experimenting with her practice. She explained that she was no longer withdrawing girls from the mathematics lessons and teaching them separately and was instead responding to her focus on gender issues by ensuring single-sex pairings for seating:

I have found that by pairing up boys and girls together [i.e., seating boys together, and girls together], the girls work more at their own pace and they will work together better . . . they are worried about explaining and it does help their confidence a bit more. So I have deliberately done that and I have noticed that since September that . . . they are putting their hands up and wanting to share their ideas and learn from each other. Whereas if I put a girl with a boy it was just chaotic.

Louise also pointed out that during her teaching she was making a deliberate effort to target girls when asking questions and requesting pupil feedback during lessons. Here she refers back to the lesson just observed, demonstrating extended noticing on a macro level:

Don't know if you noticed but I deliberately picked the girls to answer. I do pick the boys but I deliberately make an effort and I don't know if it is because they are quiet and shy. I do get the quiet girls to come with their answers just to build their confidence up. I was aware that I was doing that. I have to quickly get back in and ask the boys so that they don't feel left out.

And even more specifically:

Like the two girls I spotted straight away that they were using the circles so I went over to them and I used the fact that they hadn't got it and picked up on them to explain it later, and praised them when they had got it.

### **Researching from the Inside: 'Macro-noticing' as Agency in the Curriculum**

During the interview, it also emerged that Louise was noticing at a macro *strategic* level in terms of curriculum choices which were evidenced by her classroom-level noticing. On the basis of what she explains as a more diagnostic approach to children's learning, she has adjusted her teaching:

Like the assessments . . . I knew that they needed this work because on Friday I just gave them some simple mental maths test. . . . 'What is the total of  $4 + 7 + 16$ ' and none of them got it right. [I'm] using assessments a lot more and doing prelearning activities. Knowing what's coming up but looking at what I do before that to find out what the children. . . . 'Are they actually going to be able to do that?' [More] diagnostic to find out where the gaps might be . . .

I have changed in how I do maths than how I used to do it . . . [it's] not a case of me standing up there doing a method . . . [I] tend to do more of 'here's a calculation, have a go', and tend to get things more from the children, build on what they know already.

Extending the view, Louise situates her micro-noticing within the wider policy context in which she is operating:

The agenda has moved to progress for every child within the lesson. If they are to make progress then you need to know where each child is at. So yes become more diagnostic because of that.

As a result of her noticing at classroom level, Louise had doubts about following the recommended ‘block’ of work as presented by Primary Framework documents (Department for Education and Skills, 2006). She felt that it was necessary to take the responsibility of adjusting the curriculum where necessary.

It [MaST] has made me look at it differently. I have got the confidence now to look at the Numeracy Strategy and think that there are prerequisites to that and if they have not got that then they will not be able to do it. For me, when it comes to next week adding two digit numbers together they will be more confident. But [it is] not actually written down in year 4 strategy that they should be adding single digit numbers together. I have given mental maths a higher profile as well. Before I was just doing an oral and mental starter and assuming that they knew it but I now realise that they need to be actually taught it and if they are not taught it then it has an impact and I do make a conscious effort to do that.

Returning to discussion of the lesson she has just delivered, she supported this point with reference to her micro-level noticing:

With a lesson like that it is not about me saying this is the way I want you to do it – this is the way that you need to do it – with adding up. But with mental methods you use the method that you are most confident with . . . so like Hasan said in the end [of the lesson], ‘I used my doubles and used my number bonds and realised one was quicker’ . . . he has realised that himself without me actually telling him. And that will stick with him.

### **Discussion: Practice and Research in a Third Space**

The design of the MaST programme prioritised a methodological approach that enabled teachers to look critically at their own teaching and at the teaching and learning needs of their school contexts. Through small teaching episodes and subsequent reflection, practitioners were provided with the opportunity to develop skills of noticing and of critical reflection, taking on the role of ‘researcher from the inside’. In this paper we have demonstrated how such a role can extend into a third space in which the practitioner is enabled to develop his or her own research agenda and methodology.



On the basis of our interview with Louise during the programme, and our visit one year after she had completed it, we can see evidence of a shift in her noticing from generalisations about children as a group rather than as individuals – baseline level according to van Es (2011) – towards more established and detailed extended noticing based on evidenced observations of individual mathematical understanding. This developmental path is not new, as our review of the research and methodology of noticing shows. However, we also observed that Louise was taking on a role beyond that of skilled teacher-practitioner. The discipline of noticing as defined by Mason (2002, 2011) and others (for example, Sherin, Jacobs, & Philipp, 2011) tends to be concerned with the practitioner examining micro incidents within their practice. Our discussion with Louise suggests that it is also useful to consider noticing at a macro strategic level and the impact of subsequent responses (strategic interventions). Our case study provides evidence that the skilled ‘researcher from the inside’ switches between the two types of noticing, establishing awareness at both the individual pupil level and at a wider strategic level. Thus Louise appears to have moved from being a contingently acting practitioner, responding ‘in-the-moment’ to what she notices, to a practitioner-researcher. She is developing her own methodology for investigating the teaching and learning happening in her classroom, questioning and challenging existing discourses and practices and experimenting with new ideas to find out what happens at both micro and macro levels.

Despite the fact that this was a government-led national initiative, the way that this particular version of the MaST programme was constructed and conceived had the potential to enable participants to go beyond conventional CPD aims of developing practices in accordance with current policy. In this paper we have provided evidence that the programme facilitated the development of a ‘third space’ (Gutiérrez et al., 1999) akin to that described by Williams and Ryan (2013) in their work on lesson study. Within this third space, researcher

and teacher roles become hybridised. 'Researching from the inside' thus presents a sustainable path to a deeper understanding which extends beyond the MaST programme itself, creating opportunities for teacher agency and development of praxis through a change in roles. Sustainability thus comes through the empowerment of the teacher via an emergent participant perspective which enables context-sensitivity and a response to learner identities and local knowledges in the pursuit of particular social justice concerns.

## References

- Barnes, Y., Cockerham, C., Hanley, U., & Solomon, Y. (2013). How do mathematics teaching enhancement programmes 'work'? Re-thinking agency in regulative times. In V. Farnsworth & Y. Solomon (Eds.), *Reframing educational research: Resisting the 'what works' agenda* (pp. 37–49). London: Routledge.
- Barnes, Y., & Solomon, Y. (2013). Empowering teachers as learners: Continuing professional development (CPD) programmes as sites for critical development in pedagogical practice. In O. MacNamara, J. Murray, & M. Jones (Eds.), *Teacher learning in the workplace: Widening perspectives on practice and policy* Springer.
- Department for Education and Skills. (2006, September). *Primary framework for literacy and mathematics* (Ref: 02011-2006BOK-EN). Norwich: Author. Retrieved from <http://webarchive.nationalarchives.gov.uk/20100202100434/http://nationalstrategies.standards.dcsf.gov.uk/downloader/c24fd4861898edb7afd789608a22d8b3.pdf>
- Farnsworth, V., & Solomon, Y. (Eds.). (2013). *Reframing educational research: Resisting the 'what works' agenda*. London: Routledge.
- Gutiérrez, K. D., Baquedano-López, P., & Tejada, C. (1999). Rethinking diversity: Hybridity and hybrid language practices in the third space. *Mind, Culture, and Activity*, 6, 286–303. doi:10.1080/10749039909524733
- Jacobs, V. R., Lamb, L. L. C., & Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, 41, 169–202.
- Jacobs, V. R., Lamb L. L. C., Philipp, R. A., & Schappelle, B. P. (2011). Deciding how to respond on the basis of children's understandings. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 97–116). New York and London: Routledge.

- Kemmis, S. (2012). Research educational praxis: Spectator and participant perspectives. *British Educational Research Journal*, 38, 885–905.  
doi:10.1080/01411926.2011.588316
- Leont'ev, A. N. (1978). *Activity, consciousness, and personality*. Englewood Cliffs, NJ: Prentice-Hall.
- Mason, J. (1998). Enabling teachers to be real teachers: Necessary levels of awareness and structure of attention. *Journal of Mathematics Teacher Education*, 1, 243–267.  
doi:10.1023/A:1009973717476
- Mason, J. (2002). *Researching your own practice: The discipline of noticing*. London: RoutledgeFalmer.
- Mason, J. (2011). Noticing: Roots and branches. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 35–50). New York and London: Routledge.
- Reid, J.-A., & Green, B. (2009). Researching (from) the standpoint of the practitioner. In B. Green (Ed.), *Understanding and researching professional practice* (pp. 165–183). Rotterdam: Sense.
- Santagata, R. (2011). From teacher noticing to a framework for analyzing and improving classroom lessons. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 152–168). New York and London: Routledge.
- Schatzki, T. R. (2002). *The site of the social: A philosophical account of the constitution of social life and change*. University Park: The Pennsylvania State University Press.
- Sherin, M. G., Jacobs V. R., & Philipp, R. A. (2011). Situating the study of teacher noticing. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 3–14). New York and London: Routledge.

- Sherin, M. G., Russ, R. S., & Colestock, A. A. (2011). Accessing mathematics teachers' in-the-moment noticing. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 79–94). New York and London: Routledge.
- Sherin, M. G., & van Es, E. A. (2009). Effects of video club participation on teachers' professional vision. *Journal of Teacher Education*, *60*, 20–37.  
doi:10.1177/0022487108328155
- Solomon, Y. (2009). *Mathematical literacy: Developing identities of inclusion*. New York and London: Routledge.
- Star, J. R., Lynch, K., & Perova, N. (2011). Using video to improve preservice mathematics teachers' abilities to attend to classroom features. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 117–133). New York and London: Routledge.
- Stenhouse, L. (1975). *An introduction to curriculum research and development*. London: Heinemann.
- TIMSS. (n.d.). *TIMMS Video: Public use videos*. Available at <http://timssvideo.com/>
- Torrance, H., & Pryor, J. (2001). Developing formative assessment in the classroom: Using action research to explore and modify theory. *British Educational Research Journal*, *27*, 615–631. doi:10.1080/01411920120095780
- van Es, E. A. (2011). A framework for learning to notice student thinking. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 134–151). New York and London: Routledge.
- van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, *10*, 571–596.

Williams, J., & Ryan, J. (2013). Research, policy and professional development: Designing hybrid activities in third spaces. In V. Farnsworth & Y. Solomon (Eds.), *Reframing educational research: Resisting the 'what works' agenda* (pp. 200–212). London: Routledge.

Williams, P. (2008, June). *Independent review of mathematics teaching in early years settings and primary schools* (DCSF-00433-2008). Nottingham: Department for Children, Schools and Families.

### **About the Authors**

**Yvonne Barnes** is a senior lecturer in primary mathematics education at Manchester Metropolitan University, teaching on both undergraduate and postgraduate primary courses. Her doctoral research focused on the evolving pedagogical practices of Primary Maths Specialist (MaST) teachers and their developing identities as learners, researchers, and classroom practitioners.

**Yvette Solomon** is professor of education in the Education and Social Research Institute, Manchester Metropolitan University, and professor II in mathematics education in the Faculty of Education and International Studies, Oslo, and Akershus University College of Applied Sciences, Norway. Her main research focus is on the development of relationships with mathematics from primary years through adulthood and the associated learner identities of inclusion and exclusion.