A patchwork of professional development: one teacher's experiences over a school year

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It is well recognised that professional development research often struggles to demonstrate that changes in a teacher's practice are as a result of a professional development initiative (e.g. Guskey, 2007). One reason is that teachers are influenced by a 'patchwork' of learning opportunities and it is sometimes impossible to pick out how, and to what extent, each opportunity may have contributed to these changes.

The research reported here was a joint effort between a mathematics teacher and a researcher. The paper, which draws on 'research conversations' between the authors, explores what counts as professional development for this teacher and describes his patchwork of professional development in terms of the processes in which he engages within his professional practice: exploring, experimenting and reflecting; mainly within the context of teaching but also more widely. We argue that critical reflection is crucially important within professional development, but so too is appropriate action to carry exploring and experimenting through to real development.

Keywords: professional development, reflection, research, mathematics, teaching

Introduction

The literature related to professional development for teachers of mathematics concentrates largely on initiatives of professional development, usually from the perspective of those who have set up the initiative (Desimone, Porter, Garet, Yoon and Birman, 2002; Goodall, Day, Lindsay, Muijs and Harris, 2005). There are also studies that examine more informal professional development, but again these usually focus on learning opportunities or activities (e.g. Jaworski, 2006; Kazemi and Franke, 2003). There is less literature related to the overall professional development experience, which goes beyond focusing on the initiative and looks at the teacher perspective.

The majority of research attempts to evaluate the effectiveness of initiatives of professional development, usually by gathering a) the views of teachers taking part or b) evidence of some changes in practice (hopefully related to the aims of the initiative). (e.g. Goldsmith, Doerr and Lewis, 2013). It is rare, however, to consider the effectiveness of one initiative in relationship to the overall experiences of the individual teacher or the development of an individual teacher against their whole patchwork of professional development experiences.

In accord with Bolam (2007), our philosophical perspective puts the experience of the individual teacher centre stage. For us, it makes little sense to evaluate the influence of a professional development initiative on a teacher without taking into account his/her teaching context, prior learning and previous and on-going

experience, which would include this and other past and present professional development experience.

This paper is a jointly authored by a researcher (Marie) and a teacher (John) and is motivated by this philosophical perspective. The paper is concerned with John's professional development over the period of a year and considers what counts as professional development for him and what, in particular, works for him.

John Larsen: an introduction

John is a teacher of mathematics in a secondary school (ages 11 to 18) in Nottingham in England. He has taught mathematics for twenty years with a recent weighting towards older (A-level) students. His over-arching ambition is to be a consistently excellent teacher and he believes that he can always improve his practice.

John has always been enthusiastic about pursuing his own learning he takes active responsibility for developing his practice, and is committed to putting time and effort into doing so. For example, he is a member of five professional organisations, including the Association of Teachers of Mathematics.

What we did

Between October 2012 and July 2013, John took part in a research project run by a team at the University of Nottingham. John was asked to select six Formative Assessment problem solving lessons, which include detailed guidance notes, written by the research team. The overall aim of the project was to understand how these lessons are used in authentic classroom situations in order to inform future design and development work. It also aimed to investigate whether, and to what extent, reading and following the guidance and teaching the lessons might lead to professional learning. It became clear that, as this was one of many of John's activities that might lead to professional learning, unravelling a causal relationship would be difficult, if not impossible. We were interested, however, in understanding the patchwork of professional development for an individual teacher and to understand when and how professional learning takes place, but without attempting to find causal relationships between specific activities and learning.

Our research is underpinned by a commitment to *joint* understanding; in which both our voices are equally represented. In a deliberate and genuine attempt to reach a level of equality, we decided to opt for a 'research conversations' approach (adapted from the learning conversations of Gudeman and Riviera (1995)). Using this approach involved beginning with John's list of recent experiences that could count as professional development, and then to iteratively analyse our joint understandings by developing emerging themes and related critical questions.

In order to develop the analysis, the first concern was to understand what counts as professional development, in terms of *the sorts of activity* that can be considered as 'professional development activity'. The second, related, concern relates to *the sorts of outcomes* that can be seen as evidence that professional development took place.

A patchwork of activity

The question about sorts of activity that can be seen as professional development is addressed in the literature (e.g. ACME, 2002; Avalos, 2011; Joubert and Sutherland, 2009; Muijs and Lindsay, 2008; Ofsted, 2006). John takes part in a wide range of

activities, which include more 'formal' activity such as training courses and school in-service training (INSET) days and less formal activity such as reading, browsing websites and following developments using social media. In addition, John teaches and as Eraut (2004) suggests, professional learning frequently occurs as a by-product of working.

In a series of research conversations, we attempted to determine which of John's activities counts as professional development. It became clear that none of the activities above counts as professional development *per se* for John. Instead, it appeared, we would need to frame our analysis in terms of the processes in which the teacher engages, for example, teaching, attending a workshop or reading. Our research conversations revealed that for John, these processes involve exploring, experimenting (enquiring) and reflecting either alone or with others. It is worth noting that, although the processes of enquiry and reflection are identified in the literature as key to effective professional development (Joubert and Sutherland, 2009), they emerged through conversation as John decided what counts for him; evidence, we suggest, of the authentic (thoughtful) teacher voice. Interestingly 'exploring' is less evident in the literature.

This section draws together the various aspects of John's professional development activity, with a focus on the academic year 2012-2013. The section is structured around the processes in which John engages as outlined above.

Exploring

In terms of exploring, John reads books, journals and articles (e.g. from *Mathematics Teaching* and *Educational Leadership*) widely, covering topics including pop psychology, cognitive psychology, neuroscience, business, education and mathematics. Recent examples are *Mindset* by Carol Dweck, *Professional Capital* by Andy Hargreaves and Michael Fullan, *Why Don't Students Like School?* by Daniel Willingham, *Teach Like a Champion* by Doug Lemov and *The Art of Problem Posing* by Stephen Brown and Marion Walter. These books range from general cognitive psychology, through system change to teaching and then mathematics teaching.

John also reads social media. He follows a range of tweeters, many of whom make posts relevant to his professional life (e.g. the DfE, researchED2013 and Dan Meyer) and he sometimes uses feeds such as #mathsed.

One of his key interests is in reading about initiatives in mathematics education and particularly about ideas for presenting tasks and interacting with students. He frequently finds references to resources for tasks on his various twitter feeds, the majority of which provide a link directly to the resource. He follows links and explores the resources they point to. In contrast to this somewhat ad-hoc exploration of tasks, he also visits web sites that provide banks of resources for use by teachers of mathematics; mainly *Nrich* (http://nrich.maths.org/) and the Mathematics Assessment Project (MAP) website (http://map.mathshell.org/materials/index.php). He comments that these web sites provide a 'wealth' of ideas and resources but that, like any large repository, to become familiar with what they offer takes some effort.

John attends seminars at the University of Nottingham, which expose him to some of the latest research in mathematics education. For example, during 2013 he attended a seminar related to the use of digital technologies in mathematics education, a seminar on enquiry methods in the teaching of mathematics and science and a workshop for developers on creating software to support collaboration and problem solving in mathematics lessons. He says that these seminars are valuable to him not

only because they allow him to explore ideas but because he is able to hear contributions from a variety of attendees and make contributions by representing the 'teacher voice'.

Taking part in research can also been seen as exploring. As described above, John took part in a research project with the University of Nottingham. Through this he explored new approaches to formative assessment and to teaching problem solving.

Finally, John explores ideas by participating in workshops and courses. In the academic year over which this study took place, he attended three workshops run jointly by *Nrich* and the *Primas* European project (http://www.primas-project.eu/en/index.do), he followed a Massive Open Online Course (MOOC) from Brown University on applications of linear algebra and on iTunes-U he accessed lectures on Linear Algebra from MIT. He also attended a *MathsJam* weekend where attendees share five minute presentations on interesting, surprising, fun, useful or useless topics in mathematics. More recently, John attended the *ResearchED* conference in London which explored the use of evidence in education and ways to improve communication between teachers, researchers and policy makers.

Overall, John likes exploring; he likes to increase his knowledge of developments in education, and he likes finding out about new ideas, both for use in the classroom and for general professional knowledge. He says, however, that the results of much of his finding out and exploring are not used, and that without some systematic cataloguing of his new knowledge much of it disappears. On the other hand, he often finds it provides him with new ideas to try out in his practice.

Experimenting

Within teaching, John tries out different pedagogical approaches, some of which can be seen to 'tweak' his existing practice and others of which may represent bigger changes. For example, within the *Primas* project, he taught rich investigative tasks that he might not otherwise have done, between workshops. As another example, taking part in the research project with the University of Nottingham meant that he was committed to teaching at least six of the formative assessment problem solving lessons, which involved some changes to his usual practice.

Aspects of the *Primas* tasks and the research lessons possibly represent the most significant experimentation in John's practice over the period of this study. Other new ideas he tried out include the use of *Desmos*, a browser-based html5 graphing calculator, which was recommended on Twitter. He experimented with using it in the classroom and now uses it regularly, both as a teaching tool and as an iPad App for investigation by students. The Lemov book (see above) introduced him to a range of techniques such as 'cold calling', 'right is right' and 'no opt out' which see the teacher choose which students answer questions, rather than hands up, hold out for a high standard of contribution from the students and return to students who may, initially, be unable or unwilling to answer and ensure those students finish a sequence of questioning with a positive contribution.

In terms of questioning within the classroom, he has experimented with ideas from, for example, John Mason, Brown and Walters, Prestage and Perks and Dan Meyer. He has used a strategy known as 'and another, and another, and another' in which the teacher prompting students for multiple examples of a concept in mathematics encourages them to test the boundaries of what characterises an acceptable example. Brown and Walters' work helps the teacher and students generate

a wider range of questions and possibilities and Prestage and Perks and Dan Meyer encourage rewriting existing questions to make them more engaging and profound.

John also experiments outside the classroom. He believes in a structured, shared approach to teacher improvement and experiments with ways to develop such a network with his colleagues. For example, he tries out different approaches to sharing new ideas with colleagues in the staffroom and he has developed mechanisms through which colleagues are able to share their experiences related to the departmental scheme of work through online channels. One aspect of John's professional work is the maintenance of the school's online learning resources. He constantly experiments with ways to curate these resources.

Experimenting is an important aspect of John's practice. He believes that, when he encounters ideas that may be useful in his practice it is important to try them out using a systematic approach, rather than 'just trying things'. Where the ideas to try out resonate with John's own beliefs, experimenting with them represents less of a challenge, but there are occasions where John has tried out methods and approaches about which he is more sceptical and this presents more of a challenge. For example, for some lessons within the MAP research project, he followed the teacher guidance closely, asking the students to present their work on posters to encourage collaboration while already being confident that the students could have effective discussions while writing on file paper.

Reflecting

The term 'reflection' is used widely within the literature related to professional development (Jay and Johnson, 2002; Harford and MacRuairc, 2008; Schon and DeSanctis, 1986; Bengtsson, 1995). Distinctions are made between different kinds of reflection e.g. descriptive reflection, comparative and critical reflection (Jay and Johnson, 2002) and reflection-in-action, reflection-on-action and reflection-for-action (García, Sánchez, and Escudero, 2006). The notion of reflection is clearly complex but it is generally agreed that reflection, post-hoc, is a key process within professional development. As García et al. (2006) state: "Reflection-on-action is an essential component of the learning process that constitutes professional training" (p. 2).

In the section on experimenting, above, the word 'systematic' was used to describe John's approach. For him, systematic approaches involve cycles of careful planning, trying things out and reflecting on the experience. Planning will involve, considering what to look out for (mostly in the classroom) and effective ways to assess students' work. For example, in experimenting with a new approach to collaborative working in the classroom, John would need to consider what improved collaboration might look like. Systematic approaches to experimentation would also involve gathering evidence and, finally, using the evidence to inform useful reflection.

It seems that, for John, a critical and reflective stance increases the likelihood of successful change; so 'just trying out the latest ideas' would probably not count as professional development but trying out the latest ideas and reflecting critically on the experience almost certainly would. John suggests that critical reflection is a driving process in professional development irrespective of any other processes involved.

The individual at centre stage: what works well?

This section is concerned with considering the sorts of outcomes that can be seen as evidence that professional development took place and what, in particular seems to be important in encouraging the development. Commonly, professional development is

evaluated using a number of criteria, which include teacher learning, changes in teachers' classroom practice and improved student learning (Guskey and Yoon, 2009; Muijs and Lindsay, 2008). Our focus, however, is on the individual teacher and his/her learning within the entire patchwork of learning activity and it would seem sensible to take into account his/her priorities and learning or development goals.

John's priorities in terms of professional development are almost always directly related to his current or future classroom practice, within the context of whole school or departmental policies and national imperatives. He describes his personal learning goals in terms of his attitudes and approaches.

In terms of John's priorities, it seems that the patchwork of activity John selected was effective. For example, within the mathematics departmental policy of improving collaboration between students in the teaching and learning of problem solving, he took part in the research project based at the University of Nottingham, which required him to adopt new teaching approaches. As he said, "I was interested to see if this project would help me make that [collaboration] better".

However, he also participates in a range of other activities that could be seen as professional development even though they do not relate directly to his priority area of classroom practice. He keeps up with developments and research in mathematics education, for example by attending seminars at the University of Nottingham, following social media such as Twitter and reading.

John's learning goals are articulated in terms of attitudes and approaches. For example it is important to him to remain motivated both through having expectations from other people of professional development activity and through becoming energised by things he find himself. He provides evidence that he has remained motivated and this suggests that, for him, his patchwork of activity has been effective. He describes how he feels energised through various exploring activities such as attending seminars and through taking part in courses such as *Primas*.

He also questions, however, whether teacher learning counts as professional development even if there is no improvement in student outcomes. For example, he explains that he may have learnt something that improves his efficiency as a teacher, for example introducing a system of using folders for the students' work which makes his life easier but cannot be seen as improving the students' learning in mathematics.

We have claimed above that there was some evidence of professional learning. Here we draw out aspects of John's patchwork of activities that seem to work well for him and may therefore be valued by other teachers.

As discussed earlier, one of John's goals is to remain motivated. It seems that taking part in activities that expect or require experimentation and reflection, such as the *Primas* course or the research project at the University of Nottingham works well for him. He says that sometimes even though he has found out about new ideas or approaches, he needs a 'push' to experiment with them in the classroom; with the *Primas* workshop days there was an expectation that participants would teach a rich investigative task between the workshop days and then share their experiences with others during the workshops.

John's overarching priority is to provide the best learning opportunities for students. His exploring activities seem to be important in giving him fresh ideas; equally important are experimenting and reflecting on the outcomes. He is interested in sustained change, and suggests that changes that he has maintained are those that are 'easy' for him and the students, such as the use of *Desmos*. He explains that *Desmos* is easy to use both technically and within normal classroom practice.

While John recognises the importance of reflective processes, he suggests that he values support in achieving deeper levels of reflection. To a large extent, taking part in the research project with the University of Nottingham supported his reflective activity; partly because John was 'pushed' to reflect in some detail and because the evidence that was used as a basis for the research questions was explicit.

Concluding comments

This paper has sketched something of John's patchwork of professional development, providing examples of the wide range of activities in which he engages, analysing the processes which are important to him, giving evidence of his development and suggesting what works well for him.

However, in writing the paper and engaging in research conversations, further points related to John's professional development have emerged. First, John's original conceptualisation of what counts as professional development has expanded to include creating his own resources and putting existing knowledge into practice.

John has a particular interest in resources, and has good knowledge of sources of tasks for use in the classroom as well as other resources such as videos. John also creates his own resources such as 'mini-tasks' to provide students with practice in specific skills and Apps for use on an iPad. For John creating resources involves careful analysis of the mathematical learning he intends the students will achieve by using the task or App he has created, and this, he suggests, leads to his learning.

In terms of putting knowledge into practice, he remarks that 'sometimes all that is needed is effort'. He says,

> Just get on with it and plan sequences of lessons. Sometimes professional development has nothing to do with learning new knowledge, it is more a case of putting existing knowledge to use.

The second point to emerge is that, for John, what really matters is that his professional development makes a difference in the classroom. He recognises a tendency in himself to engage in 'professional development for its own sake'. As he explains,

> Reading books, attending seminars and conferences, watching videos and indulging in social media can become ends in themselves; what seems like motivation in the teacher often doesn't lead to changes for the students.

A third point to emerge is that the work involved in writing this paper, which includes the careful and deep analysis of his own learning, can also be seen as professional development for John. This emphasises the importance of reflection in professional development.

We conclude with a final observation. John may be unusual in the extent of what he does, but the complexity of his professional development patchwork probably is not. The lesson, perhaps, is that when we speak of a teacher's professional development, we should recognise that an individual teacher's learning is likely to be influenced by far more than a single initiative. This may seem obvious, but as the introduction to this paper pointed out, it is something the literature frequently seems to overlook.

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