

Reflecting on professional development

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Reflecting on professional development

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This paper describes how a cluster of ten secondary science teachers from six different schools and colleges in the UK designed and undertook small-scale action research projects as an approach to their own Continuing Professional Development (CPD). The participating teachers identified a range of topics for investigation such as student voice, engagement and motivation in STEM (Science Technology Engineering Mathematics) learning and effective practical work. They brought their research into practice either as individuals, pairs or within a team. Central to each project was the use of reflection as a primary tool for ensuring the impact of the professional development and for stimulating a teacher-led process. Reflective practice was developed through the use of three approaches; audio sound bites, reflective blogs, and reflective discussions. The teachers used reflection as a means of self-evaluation as well as evaluation of their action research interventions. The reflective practice which the teachers engaged in enabled them to think carefully about what was taking place in a given situation during their designed interventions, to identify suitable options, and to make conscious choices about what to do in order to make a difference. The participating teachers all concluded that reflective methods that enable self-reflection as well as reflection upon designed classroom interventions are hugely beneficial to effective CPD for teachers.

Introduction

In 2005 a network of Science Learning Centres (SLC) was established in England with a mission to provide high quality Continuing Professional Development (CPD) that could lead to sustainable changes in science teachers' practice. The network and its associated partners (charitable trusts, industry, universities, learned societies, and subject associations) integrated to form a national network infrastructure of nine centres, one in each government region and a national residential centre. In a previously highly fragmented CPD market, often focussed on whole school issues at the expense of subject related professional development the 'Believers and Sceptics Report (Wellcome Trust, 2005) stated that teachers had a strong desire to engage in subject related CPD but the majority of time allocated is used to implement government driven whole school initiatives rather than providing stimulating, high quality opportunities for teachers to update their subject knowledge and try out new pedagogies. The introduction of this initiative offered science teachers in secondary and primary schools opportunities and funding to participate in subject related professional development. The network offers one day courses, longer residential programmes, on-line and school-based CPD delivered by perceived experts and teachers.

Some criticism has been aimed at this type of top-down model as there is an expectation that teachers will engage in CPD that has been identified and centrally imposed (e.g. the network offers a core programme of CPD which is based on a set of nationally identified science CPD priorities) and is determined by political imperatives such as the future supply of scientists and engineers.

This technical-outcome (Grundy, 1982) view of CPD tends to conform to political contexts which attempt to increase pupils' attainment and raise standards within schools, rather than being consistent with CPD as a teacher-led exercise in order to develop teachers' self-evaluation capabilities and understanding of wider social contexts in teaching and learning.

With this in mind the SLC network could be at risk of losing the confidence of science teachers by promoting a culture of CPD that is centrally-led and politically motivated. What is required is an approach that encourages a teacher-led agenda for CPD which focuses on processes that not only intend to develop solutions and seek change that specifically meet teachers own needs and contexts but also seek to develop teachers' understanding of the wider aspects of teaching and learning (Crowther et al, 2000). Targeted action research that

has reflection as a core element may offer an approach which acknowledges the need for developing practice but not in isolation from social contexts or political.

Considering this, the SLC network funded a pilot for a teacher-led model of CPD which emphasised reflection as a crucial agent for change through action research. The Teacher Action Research Cluster (TARC) involved six secondary science teachers, one primary teacher, and two science lecturers from a Further Education (FE) college who designed and engaged in classroom-based research. The key aim of their action research was that reflection would become a vehicle to enhance professional learning which would not only bring about change in their classroom but also enable them to self-evaluate.

Teacher CPD, action research, and reflection

There has been a surge in classroom teachers researching their own practice, as a model for their professional development, in England since 2000 when the publication of a consultation document by the then Department for Education and Employment —*Professional development: support for teaching and learning* (DfEE, 2000) stated that teachers should take ownership of their own professional development and share responsibility and commitment for development with their schools. A further document—*Learning and Teaching: a strategy for professional development* (DfEE, 2001) was released and attempted to set the agenda for teacher CPD in England into the new century. At the heart of the Labour Governments strategy was the concept of teacher as reflective practitioner (Hargreaves, 1996). And, while this concept is largely consistent with empowering and motivating teachers the underpinning agenda was political and predominantly aimed at raising standards and placing responsibility for CPD firmly on the shoulders of classroom teachers. This endorsed a technical outcome view of teacher CPD whereby teachers would undertake research in an attempt to increase efficiency rather than developing self-evaluation processes (Leitch and Day, 2000).

However, whether aimed at raising standards or developing self-evaluation skills, by encouraging the creation of an environment in which information, knowledge and resources are shared, it should be possible for teachers to develop professionally in all areas. That said it is often the case that schools do not provide the necessary conditions to encourage and support regular investigation of, and reflection on practice. The challenge for schools is to adopt conditions which will invite teachers to embrace change and effect improvement in

their practice. An environment needs to be created which supports innovative practice by teachers and allows for risk taking in the classroom. Essential to this is the provision for regular investigation, reflection, discussion and dissemination about teaching by teachers—key ingredients of an action research approach to teacher CPD.

Even though action research has become much more widely accepted as an effective and sustainable model of CPD by classroom teachers and CPD providers over the last decade or so, it appears that research engaged schools and teachers are still quite rare (Handscomb and MacBeath, 2009). That said, exponents of action research share similar views about its potential for supporting classroom teachers' professional development. Teacher collaboration and engaging in ongoing dialogue are clearly identified within existing literature as essential components. Handscomb (2002) suggested that action research has the capacity for engaging with expertise from within the school rather than importing it, and for developing communities of practice and enquiry within the school. Ponte, *et al* (2004) stated that action research is carried out through constant dialogue with colleagues both within and outside the school, while Meirink, *et al*, (2010) suggested that teacher collaboration is generally viewed as a positive element of professional development and includes working with other teachers as well as external experts.

Kirkwood (2001) reported findings from a study that explored how the external expert played a lead role during the early stages of the project, with the participants progressively taking on a more central role as the research progressed. Harwell *et al*. (2001) studied teachers' integration of technology within the classroom and concluded that CPD for classroom teachers must combine the expertise of researchers and the knowledge of teachers in a collaborative effort to maximise the potential of the research and subsequent findings. Cordingley *et al* (2003) reviewed fifteen studies reporting on collaborative CPD. They suggested that peer support collaboration in the form of either coaching, joint preparation of materials and reflective discussions were a feature of thirteen of the fifteen studies. In eleven of the studies, workshops or seminars provided an opportunity for teachers to meet collaboratively to explore new strategies and to discuss how best to adapt them to suit their own contexts.

Action research develops through a self-reflective spiral of cycles which include planning, implementing, observing, reflecting and re-implementing (Kemmis, 2007). Critical reflection

is accepted by many as one of the most effective ways for teachers to develop greater insight into their practice and career (Forde, *et al*, 2006). Reflection then can be seen as both intellectual and affective interventions with which teachers are able to evaluate their experiences in an attempt to develop new understandings. However, Admiraal and Wubbles (2005) suggested that teachers, particularly beginning teachers, often find it difficult to progress from simple descriptions of classroom practice to more analytical understandings. Nevertheless, there seems little doubt that models of reflection which encourage teachers to evaluate their teaching, and the assumptions and values that underpin their practice are seen as the most effective (Leitch and Day, 2000). These models offer a wide range of tools and techniques to support reflective practice and processes from reflective diaries to group discussions (Forde, *et al*, 2006). That said, while having a wide range of tools may offer teachers some flexibility in how they engage in reflection, in order to maximise their reflective abilities and gain the most benefit teachers must examine the tools on offer and choose the most appropriate for their purpose.

A Teacher Action Research Cluster (TARC)

Nine teachers participated in total, constituting six secondary teachers, one primary teacher and two Further Education (FE) lecturers. Four were invited to join the cluster as they had previously expressed an interest in carrying out action research to SLC staff but felt they needed support from university research staff to do so. The two FE lecturers were already involved in action research and wished to continue investigating their classroom practice with support from university staff. Three teachers signed up after seeing advertising for the programme in SLC publicity material.

The Teacher Action Research Cluster was set up with the key aim of:

- fostering reflective processes among the participants and encouraging a teacher-led CPD approach through action research
- developing knowledge (the project team) of Action Research as a model of CPD

Throughout the programme, reflection was emphasised as a primary driver for professional development. Participating teachers were introduced to a range of tools designed to encourage explicit reflection by the teachers in an attempt to support the development of their self-evaluation skills. The teachers engaged in their action research projects through three

different modes—individually, in pairs and through a small group of four. Table 1 identifies the mode undertaken by the participants, subject specialisms and research topic.

Table 1: Participating Teachers

Mode	Specialism	Research topic
individual	secondary physics teacher	active learning in A Level physics
individual	primary (KS2) teacher	use of STEM activities to enhance boys' engagement in literacy
individual	secondary design and technology teacher	video-recording STEM lessons to enable the sharing of good practice
pair	sixth form college psychology teachers	raising student attainment through enhanced practical skills in psychology
group of four	secondary STEM teachers	development and use of a pupil voice tool to inform curriculum planning

Programme of support

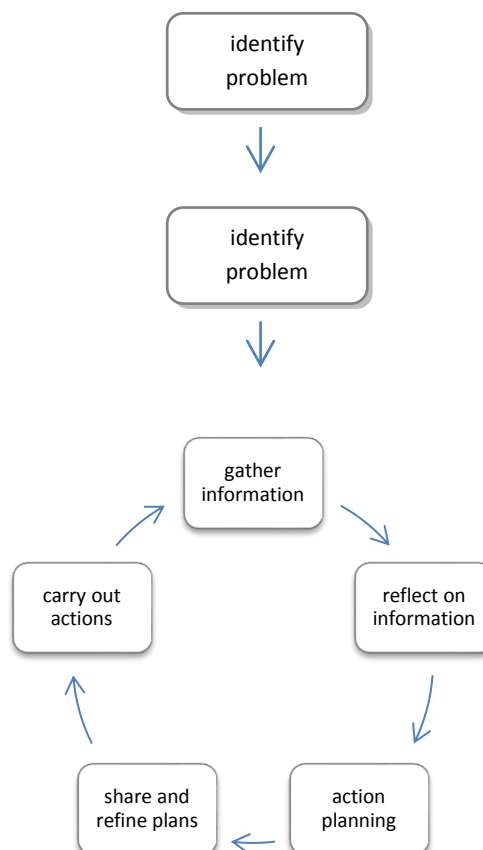
A two-day professional development course framework over a set period of 12 months was designed to support the participating teachers and delivered by the project team (university researchers and SLC professional development leaders). The course framework provided the teachers with structured support and guidance in carrying out action research through the use of action planning and reporting templates, reference literature, expert inputs and a range of tools designed to stimulate reflective processes. The programmes duration was twelve months.

Prior to attending the initial face-to-face CPD day at the beginning of the support programme, all participating teachers were asked to write a brief outline of their research project. This provided a starting point for initial discussions on the day about developing and refining an action plan for each research project. Discussion on the day also focussed on ensuring that the teachers had an effective understanding of the key principles of action research, and

opportunities were provided to share their ideas with each other, while reflecting on and developing action research plans for their specific research projects.

The second face-to-face CPD day, which took place 5 months later, enabled teachers to share their actions and research findings to date. This led to an exploration of what their research meant in terms of future practice and their own professional development. They also reflected on their progress through a typical cycle of action research (McNiff and Whitehead, 2002) and discussed what interventions and/or activities took place at each stage. Through reflecting on the action research cycle the teachers stated that even though they were conducting different research projects they had progressed through an action research cycle which was slightly different to the example they were given by the project team. The TARC action research cycle (fig.1) shows the consistent interplay that existed through the ‘share and refine plans’ step and ‘action planning’ step. The teachers stated that collaborative discussions with teachers in the TARC cluster, during both CPD days, and with the project team, during both CPD days and the school visits, had enabled them to reflect closely on these two steps which they viewed as key to the success of the other steps in the cycle.

Figure 1 TARC Action Research Cycle



Finally, in order to develop their research skills further they explored a range of data collection methods and analysis techniques.

School visits were undertaken by members of the project team to supplement face-to-face sessions. Participating teachers were visited twice with meetings intended to stimulate reflective discussions about their action research projects, reflective processes, the impact of their research, and their own professional development.

Teachers from three of the action research projects presented their findings as part of a seminar about the programme at the Association for Science Education annual conference. This provided an opportunity for them to discuss their research with other interested teachers and academics.

Reflective tools

Three reflective tools were made available to the participating teachers during the programme with the specific aims of encouraging reflective practice that would provide opportunities for the teachers to articulate and communicate professional knowledge and to foster collaboration between teachers and the project team:

- online – hub
- audio reflections
- learning and evaluation tool ‘nutshell’ - a reflective diary

These tools were embedded into the programme framework and were developed with specific purposes in mind.

On-line hub

An online community area was created for the participants – this provided an electronic storage space for course materials, a forum to communicate intersession tasks (aimed at enhancing reflective activity) and a place for all members of the group to share action plans, audio reflections, resources, and to seek advice and support as appropriate. The hub provided the flexibility for the project team and, indeed, all participants to respond to each other either on an individual level, as part of a team or to the TARC cluster participants as a whole.

Audio reflections

Each teacher was provided with a digital audio recorder to capture his or her spontaneous reflections in an attempt to provide a stimulus for further reflection and discussion. All of the teachers were encouraged to provide two minute audio reflections and to share these by uploading to an on-line community area – the on-line hub.

Learning and evaluation tool 'nutshell' - a reflective diary

The nutshell is part of a three-part *impact toolkit* developed by the network of SLCs. It is a paper-based activity used widely on professional development programmes courses to encourage and enable participants to record key learning points and actions. Its use was extended in this project as teachers completed nutshell forms both during and between the two face-to-face CPD days. Participating teachers were asked to reflect not only on the action research process and their chosen interventions, but also, importantly, on their learning. In essence, the nutshell constituted a reflective diary and action planning tool that teachers could use to record brief notes.

Methods

The project team gathered data in order to elicit participating teachers' views of the action research process they engaged in and the reflective tools they utilised. Interviews and reflective discussions were undertaken with all nine participating teachers. Systematic coding (line by line and focused) enabled members of the project team to develop analytic categories which illustrate the teachers' views. Researchers also recorded notes during both of the face-to-face sessions. Researcher notes were analysed inductively based on open coding (Cohen and Manion, 1994). Text units were arranged from the notes and emerging codes were then organised into themes based on converging responses from teachers which lead to the identification of common patterns. Other sources of data produced by the teachers such as action plans, on-line hub messages and audio reflections were treated as secondary data and were analysed through a coding process similar to above whereby emerging themes were assigned to analytic categories.

Discussion

The three reflective tools were designed to help stimulate and structure the teachers' reflections about the action research process, help them articulate and understand their reflections and to foster collaboration between all of the teachers and the project team. While

two of the tools achieved this to some degree the data suggest that the on-line hub was relatively unsuccessful in achieving its aims. Just two of the teachers interacted with the hub in a meaningful way. Both utilised the blog facility regularly to communicate with the project team and to share reflections and ideas with the other teachers. However, as with the teachers who did not interact at all with the online hub, these two teachers questioned the effectiveness of what they viewed as a tool primarily for communication that is not really suitable for enhancing reflection:

I think the hub is useful for communicating and leaving resources but I can't see its value in supporting the reflective process. I'd rather use a diary or face-to-face interaction

(primary teacher).

This view was echoed by other participating teachers. They indicated that the hub may be effective in sharing views and perhaps beginning discussions, but felt that meaningful discussion that leads to greater reflection is largely dependent upon instant responses such as during face-to-face discussions:

Its ok to upload your reflections after you've reflected...if you see what I mean. Then you can share views. But it's difficult to look at a web site and reflect on your teaching that day or any other day and then type it in as a reflective piece (secondary teacher).

It seems clear that these teachers do not view online forums designed to encourage group discussion as particularly effective in stimulating reflection, although they agree that sharing resources and stimulating discussion can be facilitated through such a medium.

The audio reflections were greeted with scepticism by the participating teachers initially and proved to be used infrequently throughout their action research projects. They appeared apprehensive about the spontaneity of the reflections and many did not like the unstructured nature of *just speaking into a microphone about how a particular activity developed* (secondary teacher). However, all of the teachers, through their modes of operation (individuals, pair or group), produced at least one audio reflection. Interestingly, the audio reflections, which were uploaded to the online hub, were later acknowledged by the teachers as being much more articulate than they had first thought:

I didn't really know what I wanted to say and just started talking. It was only after I listened to it again that I realised how much I'd taken away and understood from the day (face-to-face session 1) and your visit (primary teacher).

The teachers operating as a group of four had provided an audio reflection that was part of a reflective discussion the group had engaged in. The group stated that the outcome of the reflective discussion had provided a way forward and felt that the audio reflection adequately summarised their discussion and would be useful for other participants to learn from:

We cheated a little bit really because it wasn't really spontaneous but it might be useful for the others to listen to. It might help focus their reflections and thoughts (secondary teacher)

A secondary teacher working as an individual also found that it was useful to record what the other participants were saying:

I have found, the voice reflection good, partly because I have been recording what the other teachers have been talking about (secondary teacher).

What does emerge from the data quite clearly is that while the audio reflections were not used enthusiastically, at least initially, the teachers did begin to recognise their worth in listening to other teachers comments, bringing their tacit knowledge to the surface and helping them to structure their reflections both on their action research projects and their own professional development. However, perhaps this realisation came too late in the project to claim significant success for the audio reflection tool.

The nutshell was used quite extensively, predominantly to record questions the teachers were asking themselves as one teacher recorded:

Am I finished with the action stage? Is it time for reflection? (secondary teacher)

When asked, all of the teachers agreed that the tool enabled them to critically evaluate their actions (within their projects) and to explore their assumptions. However, the tool was not used by the teachers to reflect on their own professional development, although this was clearly an omission by the teachers as opposed to a problem with the learning and evaluation tool:

S came to visit and he got me back on track, reminding me that it isn't just about reflecting on the children's learning (action research project) but also my own learning. It was very helpful to bring this to the forefront of my mind as I was focussing purely on the successes in terms of the children's learning (primary teacher).

Most of the teachers suggested that they had been intensely focussed on their action research projects and, while they had been engaging in reflective processes they had not reflected on their own learning even though they were aware that the programme's primary aim was to

develop their professional practice as teachers. One of the teachers belonging to the group of four pointed out that:

The project takes over your thinking, you're that busy analysing the different stages and developing the next ones that you forget about your own learning and development. After you spoke to us we all said, 'yes, we have learned personally'. We just missed it and didn't articulate it to each other or ourselves. Once we realised, the evaluation tool and reflective discussions helped that process a lot (secondary teacher).

The nutshell was a success as it provided a means for reflecting more deeply on what they were learning about the action research process and enabled them to ask relevant and provoking questions. However it was less successful in promoting reflection on the teachers own learning, although that appears to be more concerned with the teachers being immersed in their action research projects rather than the tool being ineffective:

I am beginning to understand where on the action research cycle our research is and understand which steps to take next (secondary teacher).

The data shows that two of the three reflective tools were of limited use within the context of their specific aims which were to encourage reflective practice that would provide opportunities for teachers to articulate and communicate professional knowledge and to foster collaboration between teachers and the project team. That said, the data does suggest that the audio reflections tool does have potential if presented to teachers with a clear understanding of its intended use and limitations. The nutshell was by far the most successful tool of the three with all the teachers agreeing that they will probably utilise the tool on a frequent basis.

The exploratory nature of this pilot programme meant that the project team had not developed comprehensive descriptions of the scope and structure of each tool. The online hub was clearly viewed by teachers as a communication media and not a tool to encourage reflection. This is interesting as prior to beginning the programme the project team perceived the hub as having significant potential for stimulating reflective discussions between the TARC cluster and the project team. However, while the teachers recognised the hub as an effective repository for storing resources, communicating with the project team and sharing ideas they did not accept the hub as a stimulus for reflection.

All nine teachers in the TARC cluster clearly indicated that the most effective approach to stimulating reflection used within the programme was face-to-face discussions conducted throughout the two CPD days and the school visits. The teachers stated that they were able to build up their self-confidence during the first face-to-face CPD day by listening to other

teachers describe their initial plans and views of action research, discussing ideas as a whole group, asking spontaneous questions of the project team, and listening to action research descriptions from the project team. They believed that these particular elements of the face-to-face sessions developed their confidence to undertake their action research projects successfully:

Seeing examples of other action research projects from teachers of different age groups encouraged me (FE lecturer).

The teachers also valued the face-to-face interaction offered through the school visits made by the project team. The teachers agreed that consistent contact with the project team allowed them to tap in to the team's expertise to inform their own thinking and decision making which in turn enhanced their confidence to develop new stages and stimulated them to ask more questions:

I think we all found it useful to be able to talk to you and the others (project team) during the CPD days and when you visited. Being able to get answers to questions and being told that we're on the right track motivates you to keep going (secondary teacher).

The evidence shows that the impact on the teachers' professional development is stark. Their understanding and application of action research, associated methods and reflective processes has developed significantly. But of more importance is the development of their self-confidence to engage in such activity. Prior to enrolling on the programme each teacher had little more than an interest in or basic knowledge of action research and none of them were engaging explicitly in reflective processes. All of the participating teachers have agreed that they are now aware of when they are engaging in reflection and feel that they have developed their skills enough to learn from their reflections and improve their overall practice and knowledge:

I know I must have done it (reflect) all the time after school or lessons, but I can't honestly say I was aware of doing it and that I learnt from it. I now consciously reflect and feel that I can learn by reflecting (primary teacher).

The data also indicate that the teachers' ability to articulate their knowledge and understanding of pedagogy has been enhanced. Their ability to make explicit their understanding of not only their practice but also of how to develop their knowledge further is appropriately demonstrated by one of the secondary teachers:

I hope to draw together the current literature on gender in STEM to provide practical action to develop equitable routes for learning and teaching in STEM (secondary teacher)

Responses from the teachers also show that the dissemination of their work through presentation at the ASE conference was highly valued. The collating and summarising of their work represented an important reflective step in their action research cycles. They also viewed presenting their work to peers and others an important element of their professional development:

Presenting at the ASE in front of academics was a real challenge (secondary teacher).

The importance of working with external experts was also seen by the teachers as an important element of the programme. The teachers did not view the input of the project team as top-down, rather as a collaborative effort which allowed them to tap in to external expertise:

I think it has been collaborative, especially the CPD days. You have different knowledge to us and being able to learn from that has been very useful (primary teacher)

Conclusions

The TARC pilot programme aimed to foster reflective processes among the participants and encourage a teacher-led approach to CPD through action research that would develop effective collaboration between participants and the project team. To a large extent the programme can claim to be a success in that it did foster reflective processes, particularly through the provision of opportunities to conduct reflective discussions and through the use of a learning and evaluation tool (nutshell), and to a lesser extent, through the use of audio reflections. Also, effective collaboration between the TARC and project team was developed through consistent methods such as the school visits and face-to-face CPD days. These findings support existing literature which describes these particular elements of action research as crucial to successfully supporting teacher development (Handscomb, 2002; Ponte, *et al*, 2004; Meirink, *et al*, 2010). Also, Kirkwood (2001), described how external experts play a lead role early in programmes similar to the current TARC model but then gradually move in to a more supporting role as the teachers gain independence within the programme. This can also be claimed of the TARC programme. The programme also encouraged teachers to engage in reflective processes which would enable them to understand and articulate their knowledge of pedagogy more efficiently. There is also evidence to show that the teachers gained some understanding of the wider implications and contexts of teaching and learning through their research by engaging in collaborative discussions with other

teachers and the project team and through elements of their research such as literature reviews. It may be premature to claim that a community of practice, where teachers share common experiences and work towards solutions that specifically meet their own needs and contexts, has been fully established. However, there is evidence to suggest that this pilot programme has provided an appropriate framework that, with some development, can foster a teacher-led CPD programme that has action research and reflective processes as central features.

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