Art. # 790, 15 pages, http://www.sajournalofeducation.co.za

When teacher clusters work: selected experiences of South African teachers with the cluster approach to professional development

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Recent scholarship on teacher professional development has shown renewed interest in collaborative forms of teacher learning. Networks, communities of practice and clusters are related concepts that describe forms of collaboration between schools and/or teachers that encourage such learning. In South Africa, teacher clusters represent a relatively recent and popular experiment in teacher professional development. However, there is no verdict yet about their effectiveness. While the utility of such collaborative structures for teacher learning is fairly well established in many developed countries, we still know very little about how the intended beneficiaries (the teachers) experience these non-traditional structures of professional development. Using qualitative data from a large-scale research project, we explore teachers' perspectives on what constitutes a successful clustering experience, and the kinds of professional development benefits they derive from their participation therein. Our major findings are twofold: First, clusters seem to enhance teachers' content knowledge and pedagogical content knowledge. Second, and somewhat unexpectedly, the teachers identified another set of benefits, the so-called "process benefits" that include collaboration, instructional guidance and teacher leadership. In a context where teachers have tended to work solo and insulated their classroom practices from influence, the presence of the "process benefits" represents a significant finding. We conclude the paper by exploring several possible directions for further research on these process benefits of clusters for teachers in South Africa and elsewhere.

Keywords: instructional guidance; professional development; teacher clusters; teacher collaboration; teacher leadership

Introduction

The on-going professional development of teachers is a priority in many countries around the world. It is viewed as the most effective approach to improve the teachers' instructional practices after they enter the workforce (Fraser, Kennedy, Reid & McKinney, 2007). International evidence suggests that the progress of educational reforms depends on teachers' individual and collective capacity and how the reforms link with the school-wide capacity for promoting pupils' learning (Stoll, Bolam, McMahon, Wallace & Thomas, 2006). Building capacity is thus critical, and that is what continuing professional development (CPD) aims to achieve. Bolam (2000) holds

that CPD is an essential part of improving school performance. Since the goal of most education reforms is to improve teacher performance and student learning, the CPD of teachers will for the foreseeable future continue to feature prominently in the larger education reforms. High-quality CPD is inevitably a central component in nearly every modern proposal for improving education.

CPD programmes vary widely in their format and content. Most, however, share a common purpose: to alter the knowledge, beliefs and practices of teachers (Guskey, 2002). Indeed, intensive CPD programmes can help teachers to increase their knowledge and change their instructional practices (Borko, 2004). In South Africa, the challenge has been to find CPD formats and practices that have the potential to change teachers' knowledge and classroom practices for the better. The use of teacher clusters forms part of the drive to improve teachers' classroom practices and learner performance. It is one of the recently adopted and popular forms of CPD in South Africa. The verdict on its effectiveness and of networks generally is still unclear (De Lima, 2010). The contribution of this paper is thus two-fold. First, we seek to contribute to the global discourses about the efficacy of using teacher clusters, one form of the collaborative approaches to professional development. Second, and most importantly in the context of South Africa, we seek to document and understand teachers' experiences of transformation, as it relates to the use of non-traditional approaches to professional development.

Background: the Mpumalanga Secondary Science Initiative (MSSI)

The context of the present research is one large-scale CPD project for science and mathematics teachers in the Mpumalanga province of South Africa, the MSSI project. In an attempt to bring the CPD intervention closer to the teachers and the classrooms, the MSSI adopted a strategy that involved the use of teacher clusters to replace the normal cascade approach (where subject advisors trained the heads of department who then trained the classroom teachers). The clusters were intended to impact on the teachers' classroom practices more directly than had been the case with the cascade approach.

In its implementation, the project targeted the following three major stakeholder groups: First, there were the primary and secondary teachers of science and mathematics. The teachers were expected to form subject groups or clusters. Cluster teachers would meet on a regular basis for sharing and other CPD activities. Second, there was a group of teacher (cluster) leaders who provided leadership to the clusters (the cluster leaders). The cluster leaders are officially recognised by the Mpumalanga Department of Education as teacher leaders who are entrusted with the responsibility of facilitating the cluster meetings. Third, the subject advisors are responsible for, *inter alia*, supporting the establishment and functioning of the clusters. Subject advisors are specialists who are employed to facilitate subject-specific support for teachers in schools. With the support of professors from two universities, one local and the other in Japan,

the cluster-based approach to CPD for science and mathematics teachers in Mpumalanga was established in 2004/2005.

Key concepts and related literature

Collaboration between schools and teachers to improve teaching and learning can take various forms (Delport & Makaye, 2009; Giordano, 2008; Wohlstetter, Malloy, Chau & Polhemus, 2003). Internationally, "networks", "federations" and "clusters" are regarded as related concepts, although they have different nuances and implications. In some contexts, for example, teacher networks are also referred to as teacher learning communities (TLCs) or professional learning communities (PLCs), taking from Wenger's (1998) concept of Communities of Practice (CoP). Research on groups of teachers who come together, often voluntarily, to engage with matters of practice has been the dominant strand of research on clusters or networks (see Jita & Ndlalane (2009) for a discussion on this issue). Sadly, though, much of the research has focused largely on developments in North America. The concept of clusters (as opposed to networks or teacher communities) is largely associated with work in developing countries, and tends to define groups of schools that are brought together for what is mostly administrative or organisational capacity purposes (see Delport & Makaye (2009) on school clusters in Zimbabwe; Dittmar, Mendelsohn & Ward (2002) on clustering in Namibia). Giordano (2008) traces the history of clusters as far back as the 1960s, to Latin America where "their original objective was essentially pedagogical and administrative" (Giordano, 2008:11). She contends, however, that in recent times the model of clusters has "developed everywhere under different names and can be found in rural and urban areas in Latin America, Asia, and even industrialised countries…and has been given different objectives including pedagogic, economic, administrative, and even political tasks" (Giordano, 2008:11). In spite of the conceptual fuzziness, in the South African context in particular, teacher clusters represent a fairly recent experiment in the field of CPD and are seen as being more suited to helping teachers change their knowledge and practices (Jita & Ndlalane, 2009). Scholars concur that cluster membership has several advantages, including the enhancement of a school's general performance by building strong teacher professional communities (see Dittmar et al., 2002; Madungwe, Mavesera, Moyana & Seremwe, 2000; Muijs, 2008). The sharing and exchanging of expertise are improved when teachers learn together and solve problems collaboratively. In addition to collaboration and collegiality, scholars who study teacher networks, further contend that clusters promote decentralised decision making and help to increase participation in CPD (Villegas-Reimers, 2003).

Teacher networks enable teachers to work together on problems they experience in practice, and thus promote their own CPD as individuals and as groups (Villegas-Reimers, 2003). Teacher networks can be created either relatively informally through regular meetings between teachers, or formally, by institutionalising the relationships, communication and dialogue (Lieberman, 1999). In support of the idea

of using teacher networks to foster teacher development, Huberman (2001) presents a model that involves teachers who may be in the same or different schools or who share a common grade level or discipline, subject matter or activity to be worked on. In this model, he argues strongly for the need for teachers themselves to manage the networks. Such a structure fosters the emergence and development of teacher leadership. The networks generate a process whereby teachers can communicate, share and address issues, observe one another's work and develop expertise in various aspects of their teaching practice.

Research also reveals that teachers from schools in mutual clusters experience less stress and difficulty when implementing a new curriculum (Muijs, 2008). Furthermore, schools in disadvantaged communities, in particular, benefit more when teachers are exchanged, resources combined and leadership shared (Muijs, 2008; Wohlstetter et.al., 2003). Researchers have thus argued that clustering of teachers, as a type of formal school collaboration, can and should be considered as a possible intervention strategy to improve schooling in South Africa because it will enhance teacher professional development (Muijs, 2008). While there is reason to be confident about the opportunities offered by the various forms of clustering and collaboration for CPD, we know little about how these work in practice and about the possible challenges that exist for the participating teachers (Jita & Mokhele, 2012). In fact, very little research, if any, has been done from the perspective of the participating teachers themselves about what opportunities and challenges may exist for them in such CPD structures (Mokhele, 2011). The present study therefore seeks to contribute to this on-going research about the benefits of CPD, especially the non-traditional forms of CPD, from the perspective of the beneficiaries.

On a conceptual note, it is important to emphasise that our paper seeks to contribute insights on how teachers experiences these CPD collaboratives or clusters, as we call them. While cognisant of the nuanced differences between the various structures, we use the terms clusters and networks interchangeably. We focus on what Giordano (2008) refers to as the educational benefits of clustering.

Research methodology

The present study was designed as a case-within-a case study (or what is sometimes referred to as a multiple case study), on the implementation of the cluster approach to CPD in Mpumalanga. A case study is defined as a design that is suited for the examination of a bounded system, or a case, over time, which employs multiple sources of data found in the setting (McMillan & Schumacher, 2010). The clusters for this study were formed as part of the implementation of the MSSI project in Mpumalanga, and have since been institutionalised throughout the province in all subject areas. The institutionalisation process remains contested, especially around the major purposes and operations of the clusters. One view sees clusters as vehicles for policy implementation, while another considers them to be sites for teacher-led CPD (Jita & Mokhele,

2012). Many clusters in the province operate somewhere between these two extremes. The present study therefore sought to understand, from the perspectives of teachers, what a working cluster looks like, what activities it performs, and how it benefits the participating teachers, if at all.

This is the case study on which the present discussion is largely focused. Within the larger case of the cluster, however, we also divided the participating teachers into separate individual cases, thus making our study an investigation of a case-within-a case study. Yin (2009) identifies several types of case studies, viz. single or multiple, with the difference being that a single case study deals with a single case whereas in multiple cases two or more cases are covered in the investigation. The logic followed in selecting multiple cases is replication of results and not sampling (Yin, 2009). That is, multiple cases make stronger claims possible by replicating emerging patterns among the different cases studied. The present investigation involved eight teachers, as individual case studies of teachers' participation in non-traditional forms of CPD, who together constitute a single case of teacher clustering in the Mpumalanga province.

For the sake of convenience, we sampled those participants from whom we could get the most data, that is, those who had participated in both phases of the MSSI project from about 1999 to 2007, and who are still involved in cluster activities within the one focus district of Mpumalanga. The target population was the science and mathematics primary school teachers (Grades 1-9) in the one district that started with the project in 1999. We examined the original lists of the project participants and also received nominations from district officials of teachers who would have been teaching Grades 8 or 9 when the project commenced as a secondary-school intervention. Although characterised as being part of the General Education and Training or primary-school band, most Grades 8 and 9 teachers are physically located within secondary schools rather than the primary schools. This gave a total of about 15 possible participants; we were able to secure interviews with only eight, for various reasons including convenience, availability and possibly avoidance by some participants. In the sample of eight teachers, five were male and three were female and half of them (of which only one female) were or had been cluster leaders before. The pattern, namely, that more males participated in and lead the cluster activities was representative of the general pattern we had observed for science and mathematics across the province. Following the ethical clearance protocols of the local university, we obtained permission from the district office, the school principals and the participating teachers to conduct two one hour-long interviews with each participant. We also took extra care to secure informed consent from the participants and provided space for exit from the research for those wishing to do so at any stage. We conducted these semi structured interviews on the school premises during lunch or after school, focusing on the teachers' experiences of participation in the clusters. We concentrated specifically on the activities of the clusters and how it benefited the teachers, if at all. All the

interviews were recorded and transcribed verbatim.

Before data analysis, each interview was transcribed and returned to each interviewee to check for accuracy of content. Two researchers then coded each transcript using predetermined themes following the process outlined by Tesch (1990), which involves identifying units, categories and themes from the interview data. In the discussion section, we highlight four major themes that characterise successful clustering for the sample teachers. We divide these themes into two groups, namely the "product benefits" and the "process benefits" of clustering.

Findings and discussion

To understand the teachers' experiences of successful clustering and the benefits thereof, the discussion is arranged around four major themes. The first theme describes the benefits relating to content knowledge (CK) and pedagogical content knowledge (PCK) - these are what we call the "product benefits" of clustering. The second, third and fourth themes are classified as the "process benefits" and include the benefits of collaboration, instructional guidance and teacher leadership. We now turn our attention to the product benefits of teacher clustering.

The product benefits: enhancing CK, pedagogy and PCK

All the interviewees agreed that one of their regular activities in the clusters was discussions on and re-examination of CK, pedagogy and what Shulman (1992) has labelled PCK. The clusters were constituted primarily along subject lines, to enable teachers of a given subject to work together on subject matter related issues. It was therefore not unexpected for the teachers to single out discussions about subject matter as one of the exemplary practices in their respective clusters. As one teacher explained, the agenda of the cluster was constructed around subject matter:

> We had a programme, that we would meet together to discuss. We were discussing maybe, I can say (*lesson*) preparations. How can we prepare together, and then looking at the challenging chapters and how we can help one another in terms of subject content. The curriculum implementer (*also called the subject advisor*) was always there to monitor and assist us (T1).

In this quotation, the teacher suggests that their programme of activities in the cluster revolved around two major subject-related activities, identification of the challenging aspects of the subject, and lesson preparation. It is not clear from this quotation whether the challenge refers only to sections that were problematic to teach so that the teachers had to "prepare together", or whether it related to their lack of adequate content mastery, which could be inferred from the latter part of the statement, "how can we help one another in terms of subject content". Whatever the case, it is clear that the teachers came together to work on content, pedagogy and PCK. According to Shulman (1992), if teachers' work involves planning what and how to teach, then the teachers need to understand their learners and the context of learning so that they can decide

what pedagogical approaches may be best suited for particular groups of learners and their contexts. It may be safe to assume that the clusters provided a space for teachers to engage in curriculum analysis, thereby enabling them to identify areas of content they found difficult to understand and/or to teach to their learners. We pursued the idea of clusters as spaces for curriculum analysis and discussion about CK and PCK with the same teacher cited above. He provided the following example to illustrate the point:

> For example in the natural sciences (*an integrated science subject taught to learners in Grades 4–9*), there are sort of different topics that involve different learning areas (*or subjects*), so you find there is a topic that one cannot teach but you can ask somebody else to teach for you. (*You*) sit together and plan. It's very simple and sometimes you find that in Natural Science and also Social Science there are sort of other learning areas integrated in them, so we organise that one will prepare whatever topic very well and go to the classroom to teach that topic (T1).

Teachers appear to use the clusters to engage much more deeply with the curriculum frameworks and also to identify and attend to their deficiencies in terms of CK and PCK. The point was also made by another science teacher in the participating group, when she explained the difficulty of acquiring mastery in the subject "natural sciences", which integrates themes from various sub disciplines:

> The clusters assisted us as we were doing Natural Sciences. Natural Sciences is a projection of geography, agriculture, physical science and biology. Four subjects! So if I have not majored in one of these subjects, it would be difficult for me to teach the other parts. So the MSSI clusters assisted us to pinpoint some of the parts that are from other subject areas (T2).

The importance of curriculum analysis and development of CK and PCK in the clusters was central to the narratives of each of the teachers we interviewed. Another teacher captured it thus:

> Ah! I think that in these kind of programmes you gain a lot, in terms of maybe your teaching styles, approaching things in the class and the sharing of ideas because to me that is also the very important thing, and also that it develops a person in terms of how you prepare your lessons in class, how to follow the work schedule and you also get some materials, you learn also to share teaching aids, because sometimes you find that in your school, you do not have this but if you sit together with the other teachers, now you are able to share. The project also taught us to improvise, that now if you don't have this you can use that. In these projects one can gain a lot (T3).

The foregoing quotation highlights three other key benefits of clusters that work, which will now receive attention: teacher collaboration, instructional guidance, and teacher leadership – what we have referred to as the process benefits of teacher clustering.

The process benefits: teacher collaboration, instructional guidance and teacher leadership

Let us revisit the quotation for further analysis. What we have not discussed so far is the collaborative processes engendered by the cluster structure itself. The foregoing quotation draws attention to the importance of "sharing of ideas". The collaboration in the cluster is a point of emphasis for this teacher. Indeed, if we were to go back to the narratives of all the teachers quoted so far, collaboration was clearly a central feature throughout the conversations about CK and PCK. See, for example, the following excerpts from the previous discussion: "we had a programme, that we would meet together to discuss"; "how can we prepare together"; "another thing is that of preparing together, it helps because we sit and plan together and share ideas". It is interesting to observe at this point that while the teachers' narratives draw attention to the importance of their gains in terms of CK and PCK, the processes through which that happens were equally significant for them. This is a vital point; especially in the context of the current discussions about how best to support teachers to improve their knowledge of teaching and their classroom practices. These narratives provide part of the answer to this question.

Teacher collaboration is a key ingredient of any successful teacher-clustering initiative. Teachers were able to make significant gains in terms of CK and PCK through their collaboration in the clusters. Another teacher captured the essence collaborations in the clusters as follows:

> The MSSI established that cluster system. Most school[*s*] are performing greatly because of some activities of the MSSI, the process of bringing together the teachers was a powerful one. Teachers now know each other, you know that, that one is specialising in such and such a subject, so we can go to him for his expertise. Teachers are willing to help each other (T4).

Two interesting points emerge from this narrative about the utility of the clusters for teachers. The first is the importance of networking and being able to locate resident expertise on particular aspects of practice, almost like providing teachers with an active and live database or directory of experts and expertise in their field of work. The more regular the cluster meetings, the more active and useful the database becomes. The second point is the importance of the teachers' willingness "to help each other". Coming from the participating teachers themselves, who are members of a profession in which isolation and "closing the classroom door" are often the norm, the willingness to help each other would be a significant contribution to the profession by the teacher clusters. In discussing the significance of collaboration, another excited teacher said the following:

> I believe in clusters. You see, coming together helped us great deal, it was good to share ideas because we are all not the same. Some have knowledge on what others do not have. I really enjoyed them, because as I said, in a circuit teachers come together and prepared together what we were going to do in school. You

> always knew whatever you are doing the other teachers are on the same page, most importantly, the sharing of information (T5).

Yet again, the need to share and collaborate for the enhancement of CK and PCK is evident. However, the foregoing narrative introduces another key dimension of the benefits of clustering for teachers, namely, the argument that clusters enable the teacher to know that what she is doing in her classroom is no different from what might be happening in another classroom in the same subject across the district or province. It is essential for her to know that "other teachers are on the same page".

Thus far we have cited the discussion between teachers about "planning together", "how to prepare a lesson", "how to teach" a challenging topic or being taken through "experiments" or "the same content to be taught", as examples of the focus on enhancing teachers' CK or PCK, and perhaps, as examples of the collaborative space created by the clustering process. There is another way of looking at these processes, which is significant in the South African context where curriculum development and guidance are fairly centralised. South Africa has a centralised system with a national curriculum that is implemented throughout the schools across the nine provinces of the country. A common approach to curriculum guidance is to provide curriculum workshops to selected officials from each of the provinces with the expectation that they will, in their turn, facilitate workshops for all the teachers in their provinces. While this model continues to be popular, education researchers have written about the weaknesses of such a cascade model of curriculum guidance and professional development (Dichaba & Mokhele, 2012). It is in this context that a system in which clusters provide models on "how to prepare lessons" or "how to teach challenging topics" becomes significant. It provides much needed *guidance* for teachers on *what to teach*, *when*, *how* and *with what resources* – these are the central tenets of any instructional or curriculum-guidance system. Our focus teacher above provides an account of how this instructional guidance is provided in the clusters: "it develops the person in terms of how you prepare your lesson in class, how to follow the work schedule and you also get some materials, you learn also to share teaching aids… ." This is vastly different from simply promulgating a policy and/or instructions about what to do, when and how. Such instructional or curriculum guidance which is based on modelling for the teachers, to show them exactly what is expected of them, is rare, particularly in countries with a national curriculum policy. For the clusters to model these kinds of expectations would be a vital contribution in terms of developing a responsive instructional guidance system for the country. Another teacher, who is a cluster leader, described this instructional guidance a follows:

> I participated in the cluster and fortunately I also became a cluster leader, so it was my responsibility as a cluster to make sure that I organise the teachers, where we draw a common pace setter so that what is done in this school this week is also what is done in that school. So we were teaching the same thing, same week, same time. So we would be writing the same tests at the same time. We were also

> inducting teachers in the subject as a cluster and we would also rotate to schools teaching (T5).

According to this cluster leader, the instructional guidance system in her cluster included three key activities: common planning or "drawing a common pace setter", setting common assessment tasks and doing team teaching in the different constituent schools. The focus on these three activities is what makes this instructional guidance system different from the norm. The norm is to prescribe a curriculum, hope or expect that teachers will understand and teach it as intended, and then to set system-wide assessments of learning. The interconnections between planning, teaching and assessment are often lost in the process.

The third and final benefit of clustering is what our informant above refers to as the fortune of becoming a "cluster leader". The opportunity to become a teacher (cluster) leader, who is recognised by and works with other teachers to improve instruction, constitutes a significant benefit of clustering, not only for the teachers, but also for the system as a whole. One should bear in mind that the key role of these teacher leaders was not only to help teachers with challenging content topics, but also to set up and organise the processes of the clusters. Organising these clusters is no simple task for these otherwise "untrained" teacher leaders. Interestingly, their role also included induction of new teachers into the subject. Such a role is fairly unique but probably essential for a cluster to perform. This would be important, especially in contexts in which the subject leaders in a school are not as strong in the subject matter or are simply not there, as would be the case in small and/or rural schools. The role of a cluster leader is an intense one. These teacher leaders had to be hands-on as both classroom teachers and leaders of the clusters at the same time. To illustrate the intensity of the role, our teacher leader above characterised his role as follows:

> I was a cluster leader. I was the one that was organising the activities, making sure that at least per month we are having two formal meetings, where we discuss issues. But every week we would be having an INSET where we would be dealing with problematic topics in science, and it was not that I am always the one leading; we gave each other time to present something, because you are not going to say if you are a physical science teacher you know everything in the subject. You might be good in one section and not good in another. So we were given a chance, so once a week we would be doing these presentations, and then twice a week we would then visit the schools after coming up with a topic like organic chemistry and teaching the topic in a school and then going to the next school (T5).

In this conversation, our respondent explained at length how his cluster functioned and what his role as a cluster leader involved. He draws attention to the collaboration in the cluster, including how leadership roles are shared and distributed in the cluster. The unique feature of his leadership was the ability to organise not only the cluster meetings, but also the lesson study sessions where the teachers would prepare together and

move from school to school teaching the same lesson to various groups of learners with other teachers playing different roles, from being the observers to being the facilitators (Ono & Ferreira, 2010).

The hands-on approach of the cluster leaders is further illustrated in the following narrative:

> As cluster leaders, we encouraged and showed teachers how to develop the lesson plans. We assisted them to prepare, teach and assess the learners. In one region, we taught the same thing so that if a learner moves from one school to the other, she/he must not find it very strange (T5).

As suggested above, the roles of teacher leadership and instructional guidance are intertwined and play out in the context of collaboration on CK and PCK in the clusters.

Discussion and conclusion

It is argued that one of the means for realising collective participation in a CPD project is by ensuring that there is recruitment of (several) teachers from the same school, grade or department (Borko, 2004; Desimone, Birman, Porter, Garet & Yoon, 2003). Such an arrangement sets up potential interactions and discourse among colleagues, which can be a powerful form of teacher learning. In Mpumalanga the clusters were constituted by teams of teachers from various participating schools. A cluster would define a group of teachers from a set of schools in a geographical area (called a circuit). Through the clusters, the teachers were able to collaborate and share their experiences as described by our interviewees in the previous section. The focus of collaboration included such activities as curriculum analysis, lesson planning, lesson presentation, assessment, lesson studies, sharing ideas on CK and PCK. All these activities centred on improving instruction and student learning. Besides the CK and PCK, the teachers also shared and compared notes on their problems around pedagogy and classroom practice in general. Several researchers (Dittmar et al., 2002; Muijs, 2008) concur that such cluster membership by teachers has several advantages, including the fact that the exchange and sharing of expertise are improved as stakeholders learn and solve problems collaboratively. Villegas-Reimers (2003) argues that networks thus allow teachers to promote their own professional development as individuals and as groups.

The MSSI teachers confirmed that these cluster meetings were useful in many ways, including the fact that they also learnt about and conducted lesson studies during these cluster meetings (Jita, Maree & Ndlalane, 2007). For the participating teachers, these clusters afforded them a rare opportunity to collaborate across schools.

Teachers also raised the issues of observing each other's lessons and calling on other teachers to assist when they experienced difficulties with teaching in the classroom. Indeed teachers conducted all these activities through the vehicle of a cluster.

Observing teachers has been a contentious practice in South Africa ever since the days of the rigid inspections during the apartheid era. Accordingly, many teachers pre-

fer to close their doors and refuse to allow anyone to observe them teach. They prefer to struggle on their own rather than open the door to support and collaboration. It was thus remarkable to notice that the clusters had managed to take teacher collaboration beyond just talk, to a level where the teachers could even sit in each other's classes for observation, critique and support.

Huberman (2001) asserts that networks in other contexts have managed to generate a process through which teachers communicate, address issues, observe one another and bring in experts from other fields.

The opportunity to collaborate was helpful in providing opportunities for the MSSI teachers to improve their pedagogy and, more significantly, also allowed for integration of subject matter within and across the disciplines. As discussed by some of the participating teachers, areas of difficulty in the natural sciences, for example, enabled them to bring expertise from other disciplines, thereby promoting interdisciplinarity.

The evidence suggests that the participating teachers started to favour collaboration because it provided opportunities to seek help for those who would otherwise be frustrated by not knowing the content. Indeed, it is not far-fetched to think that collaboration through clusters would have resulted in the teachers experiencing less stress (Muijs, 2008). The clusters could be an instrument to address the different needs of teachers especially in a context where they all bring variable depths of content knowledge.

The instructional guidance provided to the teachers through the clusters could be considered an innovation in the system for two reasons. First, clusters are crucial for a country in which the majority of teachers continue to struggle with either the content of science and/or mathematics or the teaching thereof (Jita & Ndlalane, 2009), because the cluster approach provides a clearly laid out and implementable instructional guidance system. Second, for a country with a national curriculum and centralised planning, it is probably significant to find a fairly decentralised instructional guidance system in operation, albeit by default. This finding becomes more relevant in the context of transformation to make districts and district officials more relevant in providing guidance and support to teachers in South Africa, as they do in many other countries (Bantwini & Diko, 2011; Department of Basic Education (DBE), 2011). The cluster approach to instructional or curriculum guidance, in this case, is in fact instructive. It is planned and conducted by the teachers themselves in their clusters. For the teachers to be involved in providing and receiving such instructional guidance simultaneously is even more significant and puzzling. In other words, how is it possible that the teachers can act almost seamlessly as the implementers and the curriculum leaders at the same time? Without any formal preparation for such roles, how is it possible that these teacher leaders are able to organise and facilitate the instructional guidance and professional development of their colleagues with such efficiency, if at all?

With the rise of scholarship on distributed leadership in the last decade or so, we are better able to comprehend how distributed leadership functions in schools (Leithwood & Jantzi, 2000; Spillane, 2004). However, we still have no sense of how leadership is or can be distributed in a teacher cluster. Furthermore, while we are better informed about the phenomenon of teacher leadership and how it operates in a school setting, we are yet to understand teacher leadership as it is practised outside the formal school structures. This is especially so if that teacher leadership is subject-based and designed to influence teaching and learning in the schools and district. These questions and many others about the clustering and other networking activities of subject teachers in South Africa still need answers.

Based on the evidence presented in this paper, the findings seem to support Desimone's (2009) ideas that collective participation (networks) is one of the critical features to consider when planning and implementing a professional development programme. In fact, we now know that besides its product benefits, of providing teachers with opportunities to enhance their CK and PCK, clusters have other process-oriented benefits, such as promoting significant and lasting collaborations, helping teachers to shape and champion a more decentralised instructional or curriculum-guidance system, and providing opportunities for a more engaged approach to teacher leadership. Insights on how a decentralised curriculum guidance system might emerge and work, with teachers playing a central role in their own professional development and in guiding others on how to improve classroom practice, represent fairly significant findings that have not been explored in the literature to date. More work is still needed, however, to compare the findings of this paper with other clusters and networks across South Africa and elsewhere.

References

Bantwini BD & Diko N 2011. Factors affecting South African district officials' capacity to provide effective teacher support. *Creative Education*, 2(3):226-235. doi: 10.4236/ce.2011.23031

Bolam R 2000. Emerging policy trends: some implications for continuing professional development. *Journal of In-service Education*, 26(2):267-280. doi: 10.1080/13674580000200113

Borko H 2004. Professional development and teacher learning: mapping the terrain. *Educational Researcher*, 33(8):3-15. doi: 10.3102/0013189X033008003

De Lima JA 2010. Thinking more deeply about networks in education. *Journal of Educational Change*, 11(1):1-21. doi: 10.1007/s10833-008-9099-1

Delport A & Makaye J 2009. Clustering schools to improve teacher professional development: lessons learnt from a Zimbabwean case study. *Africa Education Review*, 6(1):96-105. doi: 10.1080/18146620902857608

Department of Basic Education (DBE) 2011. *Guidelines on the organisation, roles and responsibilities of education districts: "better districts, better quality*". Pretoria: DBE. Available at http://www.education.gov.za/LinkClick.aspx?fileticket=

LHTQSnqJ49A%3D&tabid=719&mid=2030. Accessed 25 February 2014.
Desimone LM 2009. Improving impact studies of teachers' professional development: toward better conceptualizations and measures. *Educational Researcher*, 38(3):181-199. doi: 10.3102/0013189X08331140
Desimone LM, Birman B, Porter A, Garet M & Yoon KS 2003. Improving teachers' in-service professional development in mathematics and science: The role of postsecondary institutions. *Educational Policy*, 17(5):613-649. doi: 10.1177/0895904803256791
Dichaba MM & Mokhele ML 2012. Does the cascade model work for teacher training? Analysis of teachers' experiences. *International Journal of Educational Sciences*, 4(3):249-254. Available at http://www.krepublishers.com/02-Journals/IJES/IJES-04-0-000-12-Web/IJES-04-3-000-12-Abst-PDF/IJES-04-3-249-12-210-Dichaba-M-M/IJES-04-3-249-12-210-Dichaba-M-M-Tt.pdf. Accessed 25 February 2014.
Dittmar F, Mendelsohn J & Ward V 2002. *The school cluster system in Namibia*. Windhoek: Research and Information Services of Namibia (RAISON).
Fraser C, Kennedy A, Reid L & McKinney S. 2007. Teachers' continuing professional development: contested concepts, understanding and models. *Professional Development in Education*, 33(2):153-169. doi: 10.1080/13674580701292913
Giordano EA 2008. *School clusters and teacher resource centres*. Paris: Unesco, International Institute for Educational Planning (IIEP). Available at http://unesdoc.unesco.org/images/0015/001597/159776e.pdf. Accessed 26 February 2014.
Guskey TR 2002. Does it make a difference? Evaluating professional development. *Educational Leadership*, 59(6):45-51. Available at http://www.ascd.org/publications/educational-leadership/mar02/vol59/num06/Does-It-Make-a-Difference%C2%A2-Evaluating-Professional-Development.aspx. Accessed 26 February 2014.
Huberman M 2001. Networks that alter teaching: Conceptualisation, exchanges and experiments. In J Soler, A Craft & H Burgess (eds). *Teacher development: exploring our own practice*. London: Paul Chapman Publishing and the Open University.
Jita LC, Maree JG & Ndlalane TC 2007. Lesson Study (Jyugyo Kenkyu) from Jaoan to South Africa: A science and mathematics intervention program for secondary teachers. In B Atweh, M Borba, AC Barton, D Clark, N Gough, C Kietel, C Vistro-Yu & R Vithal (eds). *Internationalisation and Globalisation in Mathematics and Science Education*. Dordrecht, The Netherlands: Springer.
Jita LC & Mokhele ML 2012. Institutionalising teacher clusters in South Africa: Dilemmas and contradictions. *Perspectives in Education*, 30(2):1-11. Available at http://reference.sabinet.co.za/webx/access/electronic_journals/persed/persed_v30_n2_a2.pdf. Accessed 27 February 2014.
Jita LC & Ndlalane TC 2009. Teacher clusters in South Africa: opportunities and constraints for teacher development and change. *Perspectives in Education*, 27(1):58-68. Available at http://repository.up.ac.za/bitstream/handle/2263/13729/Jita_Teacher%282009%29.pdf?sequence=1. Accessed 27 February 2014.

Leithwood K & Jantzi D 2000. *The Transformational School Leadership Survey*. Toronto, ON: OISE/University of Toronto.

Lieberman A 1999. Networks. *Journal of Staff Development*, 20(3):43-44.

McMillan JH & Schumacher S 2010. *Research in education-evidence-based inquiry* (7th ed., International ed.). Boston: Pearson Education.

Madungwe LS, Mavesera S, Moyana D & Seremwe M 2000. Baseline study on clusters. Unpublished report. Harare: BSPZ.

Mokhele ML 2011. Teachers' perspectives on continuing Professional Development: A case study of the Mpumalanga Secondary Science Initiative (MSSI). Unpublished doctoral thesis. Pretoria: University of South Africa. Available at http://uir.unisa.ac.za/bitstream/handle/10500/4871/thesis_mokhele_ml.pdf?sequence=1. Accessed 27 February 2014.

Muijs D 2008. Widening opportunities? A case study of school-to-school collaboration in a rural district. *Improving Schools*, 11(1):61-73. doi: 10.1177/1365480207086755

Ono Y & Ferreira J 2010. A case study of continuing teacher professional development through lesson study in South Africa. *South African Journal of Education*, 30:59-74. http://dx.doi.org/10.4314%2Fsaje.v30i1.52602

Shulman L 1992. Ways of seeing, ways of knowing, ways of teaching, ways of learning about teaching. *Journal of Curriculum Studies*, 28:393-396.

Spillane JP 2004. *Standards deviation: How local schools misunderstand policy*. Cambridge, MA: Harvard University Press.

Stoll L, Bolam R, McMahon A, Wallace M & Thomas S 2006. Professional learning communities: A review of the literature. *Journal of Educational Change*, 7(4):221-258. doi: 10.1007/s10833-006-0001-8

Tesch R 1990. *Qualitative research: Analysis types & Software tools*. Bristol, PA: Falmer Press.

Villegas-Reimers E 2003. *Teacher professional development: an international review of the literature*. Paris: UNESCO, International Institute for Educational Planning.

Wenger E 1998. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.

Wohlstetter P, Malloy CL, Chau D & Polhemus JL 2003. Improving schools through networks: A new approach to urban school reform. *Educational Policy*, 17(4):399-430. doi: 10.1177/0895904803254961

Yin RK 2009. *Case study research: Design and methods* (4th ed.). Thousand Oaks, CA: SAGE.