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Empowering Teachers: An Alternative Model for Professional Development in South Africa

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ABSTRACT The paper aims at examining one example of a large and fairly successful professional development intervention programme, the Mpumalanga Secondary Science Initiative (MSSI), carried out within the South African context. The continuing professional development programme (CPD) for science and mathematics teachers was a six-year intervention programme that was carried out in one of the nine provinces of South Africa, Mpumalanga. The programme was fairly successful in enlisting large numbers of science and mathematics teachers, ensuring consistent participation of the teachers throughout the duration of the project, and in changing in some ways the teachers' knowledge and approaches to the teaching of science and mathematics in many of the schools. In this paper, the researcher uses qualitative research approaches to develop an alternative model for professional development, from interviews with a group of South African teachers who participated in the MSSI project, the researcher explore their experiences with the CPD intervention. The researcher deposit that teachers should not only be involved in the planning of the CPD programmes, but that the programmes should be aligned with their own personal circumstances and motivations

INTRODUCTION

The continuing professional development (CPD) of teachers continues to be a priority in most countries throughout the world. It is widely viewed as the most effective approach to preparing teachers adequately, and to improving their instructional and intervention practices once they have entered the workforce (Fraser et al. 2007). Furthermore, the CPD of teachers is one of the key factors in ensuring that education reforms, at any level, are effective. International evidence seems to suggest that the progress of educational reforms depends on the individual and collective capacity of teachers and its link with the school-wide promotion of the education of pupils (Stoll et al. 2006). Building the capacity to do so is thus critical, and that is what CPD aims to achieve.

Bolam (2000) argues that professional development is an essential part of improving school performance. Since the goal of most education reforms is to improve student learning and teacher performance, the professional development of teachers will, for the foreseeable future, continue to feature prominently in larger education reforms. Teachers are at the heart of such reforms for they must execute the demands of these reforms in the classrooms. High quality CPD is inevitably a central component of nearly every modern proposal for improving education.

To date, teachers have been expected to fulfil dual roles: those of teaching and of engaging in continuous professional development to improve their teaching and learning skills (Harwood and Clarke 2006). To do so, they must receive high-quality professional development and be given time to implement what they learn through validated interventions (Deshler and Schumacher 1993).

Many professional development programmes have been proposed, and all of them vary widely in their content and format. Most programmes, however, share a common purpose: to alter the professional practices, beliefs, and understanding of school persons towards an articulated end (Guskey 2002). CPD programmes are therefore viewed as systematic efforts to change the practices of teachers in the classroom, to change their attitudes and beliefs, and to change the learning outcomes of students. In her research, Borko (2004) provides evidence that intensive professional development programmes can help teachers to increase their knowledge and improve their teaching. In South Africa, the skilling of the nation's workforce is a relatively new agenda and has major political, economic and social implications. As a result, the South African government has adopted a range of programmes and approaches which are designed to support political stability, economic growth and educational development (Fletcher and Zuber-Skerrit 2007).

Theoretical Framework

The literature on CPD contains much material which includes case studies of classroom teaching, evaluations of programmes designed to improve teaching and learning, and surveys of teachers about their pre-service and in-service professional development experiences (Borko 2004). From all of this literature, Desimone et al. (2006) note that meaningful insights into 'high-quality' professional development have emerged – qualities of professional development that make it effective at increasing teachers' knowledge and skills, changing teaching practice, and improving student achievement. In addition, there is a considerable amount of literature describing "best practices" in professional development which have been developed from the experiences of experts. These practices include: a focus on content and how students learn the content; in-depth, active learning opportunities; links to high standards; opportunities for teachers to engage in leadership roles; extended duration; and the collective participation of groups of teachers from the same school, grade or department (Desimone 2002). Some studies conducted over the past decade suggest that professional development experiences that share all (or most) of these characteristics can exert a substantially positive influence on teachers' classroom practice and student achievement Birman et al. (2000) and Garet et al. (2001). Recent research reflects a consensus that at least some of these characteristics of professional development are critical to increasing teacher knowledge and skills, and improving their practice. These, in turn, do a great deal to improve student achievement.

Wilson and Berne (1999) also argue that, consistent with literature describing best practice, recent large-scale studies have shown that high quality professional development programmes include: (a) content focus; (b) active learning; (c) coherence; (d) duration; and (e) collective participation. In refining the proposition by Wilson and Berne (1999) and Garet (2001) also includes "form of activity" as one of the key features of successful professional development programmes. Before explaining briefly what each of these key features entails, it is necessary to recognise that these characteristics of professional development can be divided into two groups. First, the structural features – or those characteristics that have to do with the structure or design of professional development activities such as the form of activities teachers engage in, the duration of the programme and each activity, and the collective participation of teachers. Second, the core features which describe the dimensions of the substance or core of the professional development experience such as content or subject matter focus, active learning by the participants and coherence of the entire programme or activities.

Key Features of Successful CPD Programmes

In discussing the structural features, the form of the activity is used to refer to whether the activity is of a reform type, such as a study group or a teacher network, as opposed to the traditional workshop or conference. Duration, on the other hand, details the total number of contact hours that participants spend on the activity, as well as the span of time over which the activity takes place. The third structural feature describes the degree to which the activity emphasises the collective participation of groups of teachers from the same school, department, or grade level, as opposed to the participation of individual teachers from many different schools. While important in accounting for the success of a CPD programme, the structural features on their own would be insufficient conditions for such key successes in teacher development and growth, thus the importance of the "core or substantive features" (Garet et al. 2001, Desimone et al. 2006). The three characteristics that make up the substantive or core features of a professional development activity include active learning, coherence and content focus. Active learning describes the extent to which the activity offers opportunities for the teachers to become actively engaged in the meaningful analysis of teaching and learning. Active learning can take a number of forms, including observing expert teachers or interactive feedback and discussion after being observed; reviewing student work in the topic areas covered; and leading discussions. Coherence refers to the degree to which the activity promotes alignment in teachers' professional development generally, by incorporating experiences that are consistent with the teachers' goals and the state standards and assessments, and it encourages continuing professional communication among teachers. The

extent to which teacher learning is consistent with teachers' knowledge and beliefs is another important aspect of coherence. The final component of the core features refers to the degree to which the activity has a content focus – that is, the degree to which the activity is focused on improving and deepening teachers' content knowledge. The latter describes the link between activities that focus on subject matter content – and how students learn that content – with increases in teacher knowledge and skills, improvements in practice, and, to a more limited extent, increases in student achievement (Desimone 2009).

In the following section, the framing by Garet et al. (2001) and Desimone (2009) is employed to explain in some greater detail the relationships between the components of both the structural and the core features of a successful professional development programme for teachers:

According to Desimone (2009), there are at least two central components of a conceptual framework for studying teachers' professional development. One is recognising a set of critical features that define effective professional development, as discussed above, and the second is establishing an operational theory of how professional development improves teacher and student outcomes. The model represents interactive, non-recursive relationships between the critical features of professional development, teacher knowledge and beliefs, classroom practice, and student outcomes. A core theory of action for professional development would most likely follow these steps:

1. Teachers experience effective professional development.
2. The professional development increases teachers' knowledge and skills and/or changes their attitudes and beliefs.
3. Teachers use their knowledge and skills, attitudes, and beliefs to improve their instruction, or their approach to pedagogy, or both.
4. The new instructional practices result in increased student learning.

Desimone's (2009) model is consistent with the claim by Guskey (2002) that: what attracts teachers to professional development is the belief that it will expand their knowledge and skills, contribute to their growth, and improve their teaching. Many professional development programmes fail to consider the process of teacher change, although activities are frequently designed to alter teachers' attitudes, beliefs, and perceptions. Professional development leaders, for example, often attempt to modify teachers' beliefs about certain aspects of teaching or the desirability of a particular curriculum or instructional innovation. They presume that these changes will lead to specific changes in teachers' classroom behaviours and practices, which in turn will result in improved student learning. In agreement with this view, Desimone (2009) notes that this is a framework that suggests a sequence of events – from learning activities to changes in knowledge, beliefs and attitudes, to changes in practice, and then to student improvements. As a result of this sequence, the model could serve as a guide for when to measure what. This model, therefore, allows for the testing of both a theory of teacher change (that professional development alters teacher knowledge, beliefs, and practice) and a theory of instruction (that changed practice influences student achievement), both of which are necessary to enhance our understanding of how professional development works (Wayne et al. 2008).

RESEARCH METHODOLOGY

The present research was designed, in part, as an exploration of the utility of the Desimone (2009) model of successful professional development as described in the foregoing section. The goal was to examine one example of a large and fairly successful professional development intervention programme, the Mpumalaga Secondary Science Initiative (MSSI), carried out within the South African context. The CPD programme for science and mathematics teachers was a six-year intervention programme that was carried out in one of the nine provinces of South Africa, Mpumalanga, in the eastern part of the country towards the border with Mozambique and Swaziland. The programme was fairly successful in enlisting large numbers of science and mathematics teachers, ensuring consistent participation of the teachers throughout the duration of the project, and in changing in some ways the teachers' knowledge and approaches to the teaching of science and mathematics in many of the schools (Jita and Ndlalane 2009; Mokhele 2011; Ndlalane 2006; Pandey 2010). In the present study, the researcher sought to test the Desimone (2009) model of professional devel-

opment by using interview data gathered from several teachers who had participated in the MSSI project about their experiences with the CPD intervention.

A sample of teachers who had participated in the entire project, from year one to year six, was selected from a much larger sample of teachers who had engaged in one or more activities intermittently during the life of the MSSI project between the years 2000 and 2006. A total of 10 teachers were interviewed in depth over a three-month period, focusing on their experiences with each of the various components of the MSSI project. Each interview session lasted for a minimum of one hour, and each teacher was interviewed at least twice during the three-month period. Several of the teachers were actually interviewed three or more times during this period. Permission was obtained from the Mpumalanga Department of Education for the work, and each teacher had to complete an informed consent form detailing his or her agreement to being part of the study.

The researcher approached this as a case study of a CPD programme and used Desimone's (2009) model to elicit and analyse the teachers' perspectives on professional development. The researcher opted for a case study design as it enables the researcher to gain greater insight and understanding of the dynamics of a specific situation (Creswell et al. 2010:76). A case study is defined as a design that examines a bounded system, or a case, over time and employs multiple sources of data found in the setting (Macmillan and Schumacher 2010:24). In this paper, the case study is an in-depth examination of the extensive involvement of teachers in the MSSI project. The researcher chose this design because it also allows for a multiple-perspectives analysis in which the researcher considers not just the opinion and perspective of one or two participants in a situation, but also the views of the other relevant groups of actors, and the interactions between them.

FINDINGS AND DISCUSSION

In this section, the researcher discusses the five major findings that emerged from the data collected. In presenting the findings, the researcher focuses more on the relevance of the Desimone (2009) model to the key findings. The researcher begins by highlighting the findings, and then discusses the relevance of the model in accounting for the teachers' observations about the MSSI as a case of a CPD programme within the South African context. The researcher then concludes the discussion with a proposition of a slightly altered model of CPD to account specifically for the South African case study. It is this revised model that the researcher presents for further engagement and elaboration by researchers, especially those working in developing country contexts similar to the one profiled in this paper.

Importance of Structure in a Continuing Professional Development Programme

The MSSI teachers were both attracted to and intrigued by the structures that were used to promote teacher learning in the project. The MSSI adopted a cluster or network approach where teachers came together in smaller groups, but did not abandon the larger workshops which convene teachers from different schools to discuss issues relating to the teaching and learning of mathematics and science. The teachers met at different times and participated in activities designed to challenge and change their knowledge and classroom practices. The following reflection on the MSSI structure from one of the teachers is illustrative:

Yes, we came together as teachers from different schools. We were helping each other. A teacher would come and present his problem to the group, we would discuss the problem together, and one of us would teach the topic. As he is teaching we would identify the loopholes in his teaching and we would discuss, taking note of the problem that was raised by the teacher, if you wanted the background on the chapter you came and we discuss the chapter as a group, then you have knowledge.

The teachers found the combination of clusters and workshops to be excellent and refreshing. They felt that they gained new knowledge through sharing information with other teachers. In the clusters or networks, the teachers formed smaller subject-related groups to share knowledge and expertise under the facilitation and support of university-based subject matter experts.

Another important dimension of the structure of the MSSI relates to the teacher workshops. The workshops were presented by the

curriculum implementers (or subject advisors) to the (teacher) cluster leaders who would then train fellow teachers in the cluster meetings. Each cluster selected a leader who received further training that he or she was expected to bring back to his or her cluster. The MSSI teachers were happy with much of the information that they received from these workshop sessions and considered them to be informative and helpful in their teaching.

The third component of the structure of the continuing professional development with regard to the MSSI initiative relates to the project's study visits to Japan. The curriculum implementers (CIs) and some of the cluster (teacher) leaders (CLs) participated in a six-week group study in Japan. These study visits helped the CIs and CLs to enhance their curriculum development skills and be exposed to relevant Japanese practices that would later be useful in developing teacher and learner support materials back in South Africa.

It is these three structural components, clusters, workshops and study visits that made the MSSI rather different and special in terms of its organisation for teacher development and support.

Teacher Collaboration

Desimone (2002) and other scholars have argued that one of the means for realising collective participation in a CPD project is by recruiting several teachers from the same school, grade, or department. This allows for interaction and discourse among colleagues, which can be a powerful form of teacher learning (Desimone 2002; Borko 2004). As discussed previously, the MSSI project expected teachers to meet in clusters and this included a collection of teachers from various schools across each circuit within the province of Mpumalanga. Through these clusters, teachers could work with each other and learn new skills from one other. The teachers also supported each other by sharing their experiences as described in the following illustrative comment by one of the interviewees:

Especially on the cluster meetings, I remember I was once selected as a cluster leader, I was so involved in this one, it was a very good thing really because, we came together as teachers from different schools you sit down, you look at the challenging topics, you discuss them together, some other teachers come up with different methods of teaching, approaching the particular topics and the, if the teacher is having a real challenge or difficulty in teaching, the teacher is also allowed maybe to ask anyone from the group to go to his/her school and assist her on that particular topic.

It is evident from the above quotation that teachers from different schools met and conducted many of the activities as a group. Besides the specific content knowledge that the teachers discussed in their clusters, they also shared and discussed their problems regarding pedagogy and classroom practice. Several researchers (Muijs 2008; Marnewerk 2002; Mendelsohn and Ward 2002) concur that cluster membership has several advantages which include the fact that the exchange of expertise is improved as members learn and solve problems collaboratively.

The Content Focus and the Context of Teaching in the Rural Settings

The third finding from the case studies was on the importance of focusing on subject matter content in a professional development programme. Indeed, the MSSI project focused deliberately on mathematics and science. In all the MSSI activities, the subject matter content was an ever-present theme. For example, in the workshops and the clusters, the teachers' exchanges were all about the subject matter content and how to effectively teach it to learners:

In the workshops, they used to train us on content, because as I have indicated, you find that some topic may be just difficult for the teachers and then the CI would come and help us here (in the workshops). So when we come back from those workshops we would get to our clusters and share everything that we learned from the workshops with the teachers. We equipped each other so that we go back to our various schools and give our learners the right thing.

A similar sentiment was expressed by yet another one of the interviewees when she argued that:

I found it helpful when we did the content. I enjoyed it so much. It improved my knowledge. It was refreshing, uplifting and it really made me feel like I am a teacher. That's why I would love to go again, there are a lot of changes taking place and they need a teacher to devel-

op himself/herself. If you stay, you will be left behind!

An important variation on the content theme lies in the recognition that a professional development programme does not have to be one-size-fits-all, as teachers have different needs. This variation became an important theme in the MSSI and is what this paper seeks to highlight as a key variation to the Desimone (2009) model of CPD. It is important for a CPD programme to be modified to suit the needs of the participating teachers. For example, some schools may be rural while others may be urban and, as such, the focus should be varied to suit the individual needs of those schools. For the MSSI therefore, an important variation lies in the fact that the exploration of subject matter was mediated by the consideration of context. This was obviously very important as most of the participating teachers in this study came from the rural areas of Mpumalanga. The MSSI's use of science micro-kits and other forms of improvisation were partly influenced by this fact because, in rural settings, science laboratories and other such facilities are often not available:

In my case, I used to know that if I wanted to make use of a beaker, I must go to the laboratory which we do not have here at all. I did not know that whatever I have, I can use. So now, I just ask the learners to bring a plastic, say a coke bottle. We cut it into a beaker and we do the experiment. They have indeed helped us to do whatever practical or experiment we want to do with or without labs.

The "considerations of context" are an important variation to the Desimone (2009) model of CPD. The data in this study has therefore uncovered the importance of making context a valid addition to the theme of subject matter content development for teachers. It is this importance of context that the researcher factors in the proposed alternative modelling of CPD that the researcher presents later in the paper.

Time of Engagement

The fourth major finding of this study deals with the amount of time available for teachers to attend professional development programmes. The amount of time spent in professional development activities must receive consideration because professional development, by its nature, should happen while the teachers are engaged in their work and profession. Longer activities, as noted by Desimone (2009) are more likely to encourage in-depth discussions of content, student conceptions and misconceptions. Garet et al. (2001) draw attention to the emerging consensus in literature regarding teacher learning and professional development, about the call for professional development to be sustained over time.

The data in this study suggest that the MSSI took the issue of duration seriously and provided extended opportunities for the teachers to acquire new knowledge and practices, and then to practice those in a supportive environment (aided by the curriculum implementers and university professors involved in the partnership). The MSSI project took place over a period of six years (with an additional two years of group study visits to Japan), and this duration exposed teachers to all of the different activities within the project. Such a long duration is unusual for CPD intervention projects. The central focus of all the activities was on learning the subject matter content, and practicing the new approaches to teaching that subject matter in their own classrooms. Also significant is the fact that the MSSI not only engaged teachers over the longer duration of the project, but that the teachers also met for one day a month in their clusters and, additionally, for three day-long workshop sessions each quarter. This allowed adequate time for engagement and development.

Personal Transformation and Growth

The researcher's fifth and the final set of findings in the study suggests that personal transformation and growth are important for teachers who participate in a professional development programme. Teachers are attracted to professional development programmes not only because of the four aspects discussed earlier, but also because such programmes have the potential to fundamentally change them for the better. This is the theme that the researcher has labelled "personal transformation and growth".

One of the key attractions of the MSSI project was that it afforded the participating teachers several opportunities to change their lives. In one very vivid case, a teacher who had not previously studied, or majored in, natural science was asked by her principal to teach natural science. (She had, in fact, studied Geogra-

phy for her teacher training diploma.) This teacher credited the MSSI with transforming her from a geography teacher into a science teacher:

You see it (the MSSI) helped me so much. When I got to this school, I was asked to teach general science and I have done only biology and geography at the college. I knew nothing, nothing about science but then, by attending this programme, I like it and I am confident with teaching of natural science.

The important point raised in this quotation is how the teacher's life changed forever through her participation in the MSSI project. Although she had studied life sciences at college, by her own admission she was in no way close to being a natural sciences teacher. Her participation in the MSSI project however, enabled her to learn and develop the knowledge, skills and confidence required to teach natural sciences. Over the period of her involvement in the MSSI, she was literally transformed into being a competent natural sciences teacher irrespective of her previous qualifications. She finally felt confident that she was able to undertake all the activities associated with the teaching and learning of natural sciences**:**

This programme helped me a lot, hence I said I knew nothing about science, and then by attending the workshops and participation in the clusters I gained more knowledge and confidence on how to teach natural science. My attitude is changed. I used to think that natural science was the most difficult subject.

This is one example of how a professional development programme can begin to reshape a teachers' identity forever – changing an insecure life sciences teacher into a competent and confident natural sciences expert.

Similarly, a further example of a fundamental transformation in the lives of teachers is provided in the following illustrative case of another teacher:

The visit to Japan was an eye opener, because it's where I met other colleagues from other African states. There was a person from Zimbabwe, one from Zambia, one from Ghana, one from Tanzania and one from Uganda. You know, from my experience one could see that we were teaching the same thing but in different ways, we learned how to teach science, and how science is taught in other countries. We also engaged with (Japanese) professors on the content. They lectured us, they conducted experiments with us, and they also took us somewhere where we could see science in practice. The visit really was an eye opener; we did everything that could help one to teach science.

In the latter example, the teachers who had the opportunity to travel to Japan experienced the Asian culture and specifically the Japanese teaching culture. Even if the expedition was merely a tourist venture to the East, it may have still been a life changing experience. However, in reality it was not just about experiencing and learning another culture, but it was part of a carefully designed programme to enhance the teachers' knowledge, skills and teaching practices, and to offer extended opportunities for self-reflection and personal transformation.

From the foregoing discussion of the findings, it is therefore possible to suggest a refinement of the Desimone model. Two key additions to the Desimone model, as we highlighted, are personal transformations and the context of teaching in the rural settings. Factoring these additions into the equation, I therefore propose a new model of an effective CPD as illustrated in Figure 1.

In the earlier section on the conceptual framework, the researcher presented the following summary of that the core features of professional development activities could be expected to have significantly positive effects on teachers' self-reported increases in knowledge, enhancement of skills and improvement of classroom practice. It is primarily through the core features that the structural features, such as workshops; clusters; collective participation of teachers from the same school or cluster; or amount of time devoted to the CPD, significantly affect teacher learning.

Furthermore, Desimone (2009) found that the six features of professional development she discussed were related to an increase in teachers' self-reported knowledge and skills and changes in teaching practice. Desimone and other scholars have argued that the core features (content focus, active learning and coherence) worked through the structural features (active learning, duration, and collective participation).

The present study was designed partly to test these claims within the context of the MSSI project in South Africa. Indeed, the researcher's findings have demonstrated the validity and utility of the Desimone (2009) model in the South African context. The researcher has, however,

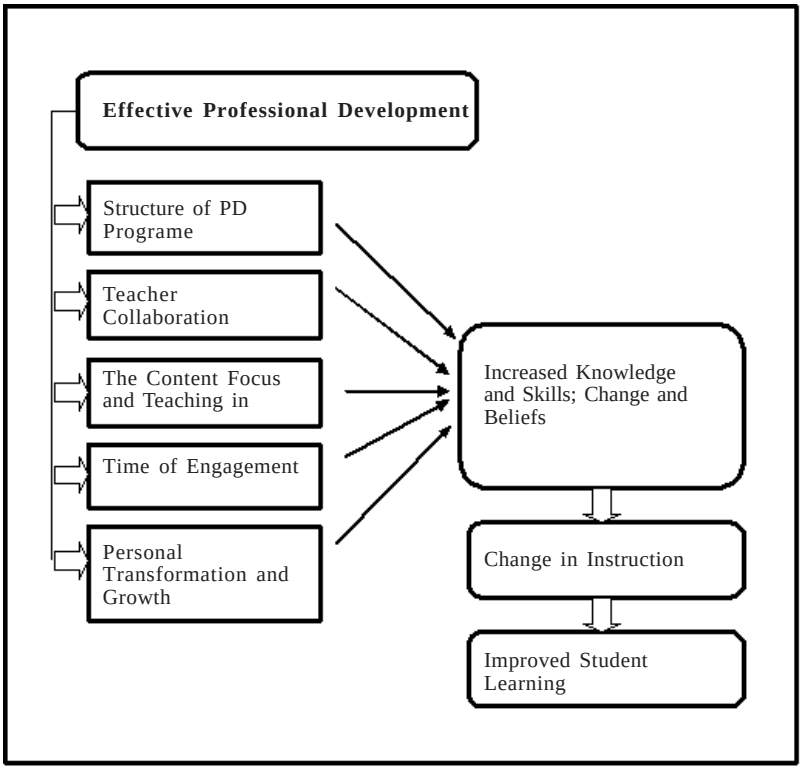

Fig. 1. An alternative model of an effective CPD for teachers

presented a revised model of CPD in Figure 1 based on the data collected in this study. The researcher model demonstrates that, while useful, the Desimone (2009) model is missing two important components that proved to be important for CPD in South Africa and probably in other developing nations too. The transformative value and the context factors constitute two important core features of CPD that are actualised through the structural features.

To restate, the Desimone (2009) thesis states that there are at least two central components to a conceptual framework for studying teachers' professional development. One is recognising a set of critical features that define effective professional development, as discussed above. The second is establishing an operational theory of how professional development influences teacher and student outcomes.

CONCLUSION

In conclusion, the researcher presents this model as a work-in-progress, in recognition of the opinions of the many teachers whose perspectives have hitherto remained unknown. Teachers do have opinions, and they know well that CPD might work to fulfil their present and anticipated needs. Many more teachers will continue to add to and refine the CPD model that the researcher has proposed in this paper. The research challenge is to continue to listen to these teachers and to explore and make sense of their experiences in the search for better models of CPD in general. The present study has set the stage for such work in South Africa.

RECOMMENDATIONS

The revised CPD model that the researcher has developed and presented in Figure 1 helps to extend the conceptualisation of the core features discussed earlier. Through a deliberate privileging of the teachers' opinions on CPD, the researcher has been able to understand the importance of the transformative value of CPD and its context as core features of any CPD engage-

ment for teachers, especially in the developing countries. While the researcher is confident about the teachers' perspectives regarding what works for them, and particularly their identification of these new core features, the operational theory on how all the factors work together to shape the desired outcomes is still a work-in-progress. The researcher therefore suggests and recommends that further research in developing countries is still needed to provide an adequate explanation of why the Desimone model and its variants, including the one that the researcher has developed in this study, work in the ways that they do to produce the desired teacher and student outcomes.

REFERENCES

Birman BF, Desimone L, Porter AC, Garet MS 2000. Designing professional development that works. *Educational Leadership,* 57(8): 28-33.

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

Borko H 2004. Professional development and teacher learning: Mapping the terrain. *Educational Researcher* 33(8): 3-15.

Creswell JW, Ebersohn L, Eloff I, Ferreira R, Ivankova NV, Jansen JD, Nieuwenhuis J, Pieterson J, Pano Clark VL, Van der Westhuizen. 2010. *First Steps in Research.* Pretoria: Van Schaik

Deshler D D, Schumaker J S 1993. Strategy mastery by at-risk students; not a simple matter. *Elementary School Journal,* 94: 153-167.

Desimone L M 2009. Improving impact studies of teacher's professional development: Toward better conceptualizations and measures. *Educational Researcher,* 38(3): 181-199.

Desimone L M, Smith T, Ueno K 2006. Are teachers who need sustained, content-focused professional development getting it? An administrator's dilemma. *Educational Administration Quarterly,* 42(2): 179-215.

Desimone LM 2002. What makes comprehensive school reform successful? *Review of Educational Research,* 72(3): 433-479.

Fletcher AF, Zuber-Skerritt O 2007. Professional development through action research: Case examples in South African Higher Education. *Systemic Practice and Action Research,* 21(1): 73-96.

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.

Garet MS, Porter AC, Desimone LM, Birman B,Yoon KS 2001. What makes professional development effective? Results of a national sample of teachers. *American Educational Research Journal,* 38(3): 915-945.

Guskey TR 2002. Professional development and teacher change. *Teacher and Teaching: Theory and Practice,* 8(3/4): 381-390.

Harwood T, Clarke J 2006. Grounding continuous professional development (CPD). *Teaching Practice,* 43(1): 29-39.

Jita LC, Ndlalane TC 2009. Teacher clusters in South Africa: Opportunities and constraints for teacher development and change. *Perspective in Education,* 27(1): 58-68.

Macmillan JH, Schumacher S 2010. *Research in Education: Evidence-based Inquiry*. New Jersey: Pearson Education Inc.

Marneweck L 2002. Images of changing curriculum. In: V Carrington, J Mitchell, S Rawolle, A Zavros (Eds.): *Troubling Practice*. Faxton QID: Post Pressed, pp. 123-145.

Mokhele ML 2011. *Teachers' Perspectives on Continuing Professional Development: A Case Study of the Mpumalanga Secondary Science Initiative (MSSI) Project*. PhD Thesis, Unpublished. University of South Africa, Pretoria.

Muijs D 2008. Widening opportunities? A case study of school- to- school collaboration in a rural district. *Improving Schools,* 11: 61-73.

Ndlalane TC 2006. *Teacher Clusters as Opportunities for Learning About Science Content and Pedagogical Content Knowledge*. PhD Thesis, Unpublished. University of Pretoria, Pretoria.

Pandey D 2010. *A Study of the Impact of a Development Programme for Teachers of Mathematics and Physical Science in Rural Secondary Schools in South Africa*: PhD Thesis, Unpublished. University of Pretoria, Pretoria.

Stoll L, Bolam R, McMahon A, Wallace M, Thomas S 2006. Professional Learning communities: A review of the literature. *Journal of Educational Change,* 7: 221-258.

Wayne AJ, Yoon KS, Zhu P, Cronen S, Garet MS 2008. Experimenting with teacher professional development: motives and methods. *Educational Researcher,* 37(8): 469-479.

Wilson S, Berne J 1999. Teacher learning and the acquisition of professional knowledge. An examination of research in contemporary professional development. *Review of Research in Education,* 24: 173-209.