Chapter four

The Structure and Formation of Clusters

4.1 Introduction

In this chapter I discuss the findings of the research regarding the structure and formation of the clusters that exist in Mpumalanga. In order to understand clearly how and why it is that clusters are well placed to provide opportunities for teachers to challenge and change their Content Knowledge and Pedagogical Content Knowledge, we first need to understand their structure, and the dynamics of their formation and basic operation. MDE and its partners opted to form clusters that will be the base and the context where INSET activities take place. Mpumalanga province is very wide and most of its areas are rural. The province is divided into three regions with very few scattered infrastructure. Most of its infrastructure is far from schools, for example, teacher centres, regional offices and circuit offices where the Curriculum implementers are based. Taking into consideration all these factors, it does make sense to make schools INSET structures where teachers can meet and work together as groups, as this reduces travelling and save money to travel to the centres. The school level, facilities and location is taken into consideration when selection is done for cluster's centre school for INSET. GET schools meet together at GET schools while FET meet together at FET schools for specific subjects. The immediate human resource support to teacher cluster is a teacher leader who is termed a *cluster leader*.

The rationale for introducing teacher clusters in Mpumalanga is to bring INSET activities to the teachers and let them own the programmes on their development internally, with little support from the experts. The underpinning strategy on cluster formation is to create opportunities for teachers to explore and share CK and PCK as peers. This sharing can take place continuously as long as it is teacher centred and addressing crucial issues of CK and PCK. We know that effective implementation on content and pedagogical content knowledge needs a little bit of both, as teachers experience difficulties in implementation of innovative ideas they undergo, '

implementation dip' (Fullan,2001). External support is provided by JICA and UP in order to strengthen the cluster activities in a variety of ways. Programmes on materials development, subject specific content workshops and classroom support are conducted. Mpumalanga as a province has 368 clusters that are registered and a few that are not registered because of the complication of numbers of schools in the area. These registered clusters are officially recognised by MDE and these I have decided to call them *dominant clusters* for the sake of this study. Farm schools are very isolated from other schools and besides, there are two teachers in some cases teaching almost all the subjects. Most of these schools did not register to any clusters. They are in a way not part of any cluster. The only support that they benefit is from the Japanese volunteers that frequently visit their schools if they have invited them for help. There were other clusters that existed before the MSSI intervention and most of them still operate as before without registering with the MDE; these I have called *external clusters*. The following discussion explores the structure and the formation of the *dominant* clusters and will later discuss the case of an *external* cluster.

The formation and structuring of clusters in Mpumalanga is a complicated process. The process is complicated primarily by the fact that not many in the province had prior experiences of working with and leading clusters prior to this MSSI initiative on clusters. Furthermore, the place of the clusters within the hierarchical structures of the Mpumalanga Department of Education was not always clear, if desirable at all. This was largely because of the fact that the structures of educational control in the province are themselves fairly complex and have been changing rapidly in the past few years, such that although I had been involved with the MSSI project more than 5 years, I had never fully understood the finer details of this complex structure of administration and control in the province. This MDE structure had a major influence on the teacher communities and clusters in the Province who had to be officially sanctioned from these structures of educational control in the province. In order to understand the operation of the Dominant clusters, we need to briefly understand the complication of the MDE management structures.

4.2 Summary of the Administrative and Management Structure of Education in Mpumalanga

The administration and control of education in Mpumalanga province is divided into three regions namely; Enkangala, Ehlanzeni and Gert Nsibande. Each region is responsible for between 15 – 25 circuits, and is headed by a Regional Director whose task is to make sure that the policies of the department are implemented across the Region. The Curriculum Implementers are appointed at and report to the regional office, even though most of them are based at the circuit offices. The Curriculum Implementers take most of their instructions directly from Head Office supervisors even whilst they are appointed in the Regions and are sometimes based in the circuit offices. The Curriculum Implementers work directly with the cluster leaders in implementing the teacher development activities at schools. The Curriculum Implementers are supposed to be the service personnel for the clusters and teachers in the province, providing the necessary guidance and expertise on CK and PCK.

4.2.1 Formation of Clusters

This discussion on the formation of clusters was arrived at through interpretation and analysis of several sources of data, including several MDE policy document on clusters, policy document on clusters prepared by JICA (the funding agency) and the notes written by one of the External Clusters (the case study for this research). In addition, I interviewed senior officials of the MDE, to get their interpretations and perspectives on the policies and their implementation with regards to clusters in the province.

For purposes of this research investigation, I have characterized basically two major types of teacher clusters in the province of Mpumalanga, viz. the Dominant Internal Clusters and the External Clusters. The major difference between the two kinds of clusters being that the Dominant Internal Clusters are sanctioned and formed by the MDE through its officials and are compulsory, while the External Clusters are formed through the initiative of the teachers themselves and are voluntary networks with no official recognition per se.

4.2.2 Dominant clusters

These clusters dominate Mpumalanga province as they are officially recognised and are formed within the existing structures of the Department of Education. I have decided to call these clusters Dominant Internal clusters. The SIM cluster discussed in chapter three is an example of a Dominant Internal Cluster in Mpumalanga. These clusters were formed under the jurisdiction of MDE. They are registered with the Department and their operations fall within the hierarchical structure of MDE. Guidance on the formation and functioning of the Dominant Internal Clusters was provided in the MDE policy documents as follows: The MDE "draft policy" on clusters stipulates that the Curriculum Implementers should form clusters of teachers in the regions based on the following guidelines:

- the phase of education of the participating schools and teachers i.e. the CIs were to separate the teachers and their clusters into General Education and Training (GET) and Further Education and Training (FET) levels;
- the subject area of focus i.e. the clusters were to be split by subject area of focus, e.g. Science versus Mathematics or Agriculture, etc.
- the geographical location of the schools in terms of their location within the circuit, region and sub-region of the MDE structuring;
- the registration of the schools as a cluster participant in the circuit;
- the election of the cluster leaders who would be responsible for the facilitation of cluster activities and finally on
- that new cluster leaders were to be selected at the end of each year.

The formation of the Dominant Internal Clusters based on these policy guidelines of the MDE is illustrated in Figure 3 below:

Figure 7: The composition of the dominant structure in Mpumalanga

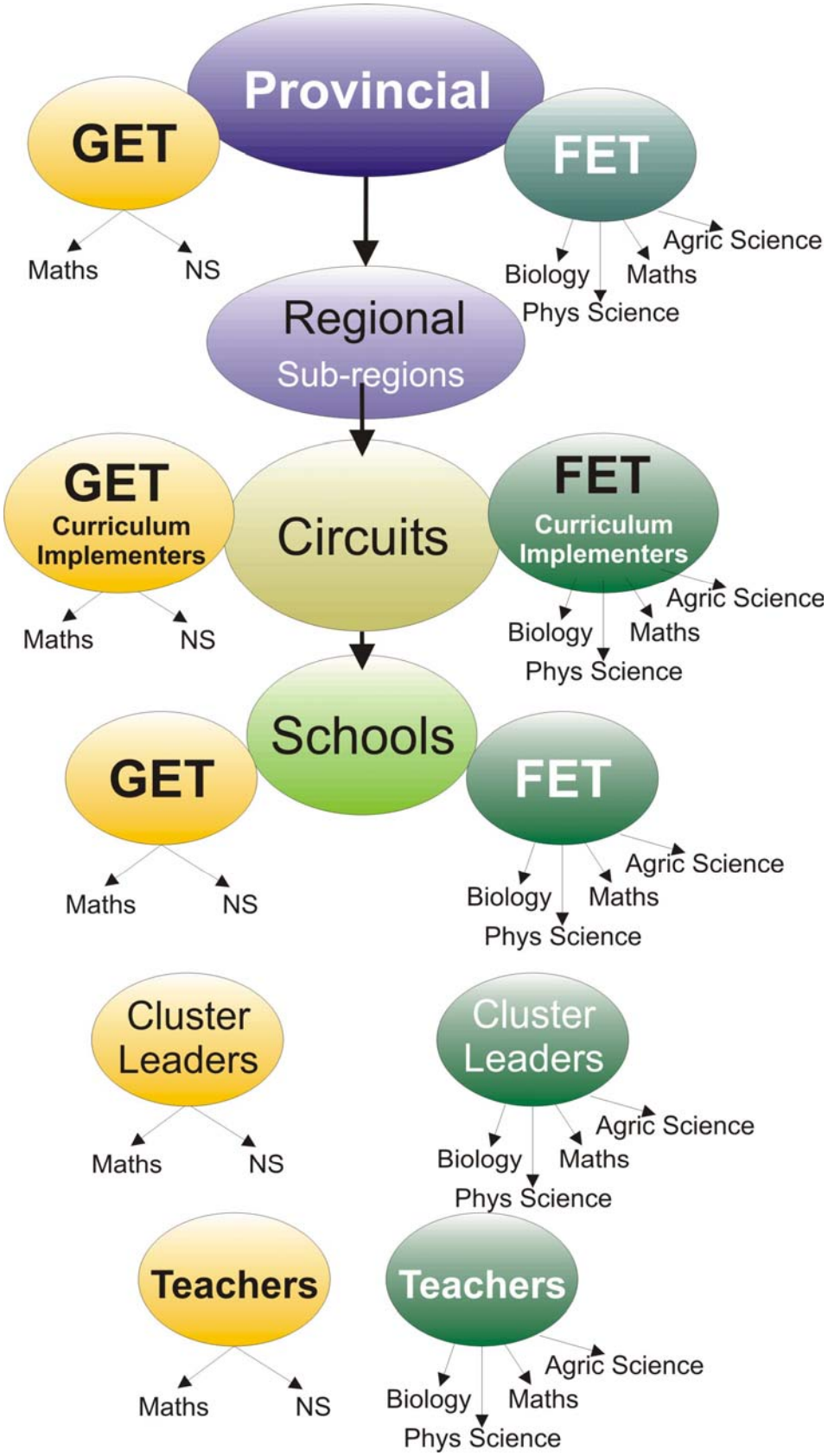

Figure 3 shows clearly the alignment of the Dominant Internal Cluster to the hierarchical structures of administration and control of education in the Mpumalanga province. The provincial structure for the leadership and control of science and mathematics education is divided (at the Head Office level, Provincially) into both GET and FET units. Within the GET unit, there is further demarcation between mathematics and natural sciences. Similarly, for the FET levels, there are demarcations between Physical Sciences, Agricultural Sciences, Biology and Mathematics. Each one of these subject areas (Four areas for the FET and Two areas for the GET) is officially led by a Deputy Chief Education Specialist (DCES). All the DCESs in a level of education report to one Chief Education Specialist (CES). This structure of control is replicated, although in a somewhat reduced manner, at the Regional office level of the MDE. Unlike at the Head Office, there is only one CES responsible for both GET and FET at the Regional levels, and the DCES in the region oversees all the subject areas in a phase of education (DCES-GET and DCES-FET).

The Dominant Internal Clusters are formed at the school level – a collective of neighbouring schools and are first and foremost split by levels of education (GET versus FET). Each of the subject areas then form their own clusters and select their own cluster leader from the participating teachers. The clusters are roughly divided by circuits – with each circuit making roughly one cluster. In one circuit, a total of six subject clusters (2 GET and 4 FET) provide for the science and mathematics teachers in the province.[1]

Figure 3 shows clearly the linkages between the various layers of control and administration of education in the province and how the clusters were co-opted into this hierarchy of the MDE structures.

In the interviews conducted with the Regional Directors and Subject Specialists at the Head Office, I was able to confirm that the formation of the majority of the clusters in the province was actually done based on the policy prescriptions as described earlier.

[1] Increasingly, more subject cluster has been formed to provide for teachers of other subject areas. However, for purposes of this research, my focus has been largely on the science and mathematics clusters that were the first to form in the whole province at the instigation and provision of the MSSI project.

Of the 30 cluster leaders interviewed, 25 confirmed that their clusters had been formed using the policy guidelines and under supervision of at least one senior education official, mostly the Curriculum Implementer. On the one hand, this structuring of the Dominant Internal Clusters within the overall framework of the MDE hierarchy clearly illustrates the commitment of the MDE to the implementation of clustering as province-wide approach to the professional development of science and mathematics teachers in the system. The MDE had bought into the idea of clustering as a more promising approach for providing teachers with opportunities for growth and development. In its current implementation in the province, clustering is likely to be sustainable and to receive official recognition within the province. Teacher clusters and networks thus received the appropriate support for their activities within the system. The official support for clusters was confirmed by one Regional Director as follows:

the subject committees had no status in the department, clusters have high status in the department and are receiving support from the CI's. They receive the incentives from the department; they are registered and the programs of their duties are demanded from them. The cluster leader that leads the cluster is a recognized official unlike the subject committee leader that was unknown

Furthermore, this senior official noted that:

the cluster leaders' structure is based on the structures of the department which make them to know exactly whom they report to at the circuit and at which level; this is very useful and important for us as a region

It is clear from this discussion therefore, that the formation of clusters was somewhat of an extension of the MDE structures designed to reach the schools efficiently by extending the hierarchy that exist presently. The obvious problem off course with this arrangement of clustering is its potential for over-bureaucratization and corruption of its purposes sand intentions in terms of teacher learning and growth. As will be discussed later in the text, these threats were actually very real in the functioning of the Dominant Internal Clusters in the province of Mpumalanga.

4.2.3 The Dynamics of Formation and Structure of Clusters

The authority structures of the MDE are so complex that they are sometimes never understood even by senior officials of MDE itself. Consider the following comment by one of the regional directors of the MDE on the selection of the cluster leaders for the teacher networks, for example:

the duration of cluster leaders is one year, but in this region the cluster leaders are not going to be changed. I do not understand why we appoint people, train them and get rid of them the following year.

From this comment, the contradictions of policy regarding the formation and leadership of clusters become obvious. These contradictions often impact on the way the cluster leaders operate within the province. For example, a Curriculum Implementer working in the same region was working on the basis of the provincial directive to elect new cluster leaders and was unaware of his direct supervisor's challenge to that policy. Here is how the Curriculum Implementer expressed his dilemma:

we were told by the provincial office that every year new cluster leaders will be selected; this now creates problem for us, because the head office tells us something and the regional office decides to do its own things.

This is just one example of the complications of policy regulating the formation and functioning of the dominant clusters that exist in the province.

Another complication brought to the fore through the comments from both the Regional Director and a Curriculum Implementer is the issue of line functions within the MDE. The Curriculum Implementers are in a precarious position because, while they are based at the regional offices and appointed by the Regional Directors, they receive instructions from Provincial Head Office. This frustration of this complicated line function structure was expressed by another Regional Director as follows:

Curriculum implementers are appointed by the region and they take instructions from the province and this is disturbing. In between, you will receive instruction from the head office saying the CI's are going for training like on a specific area (when we have programmes for them in the Regions).

This complicated structure of operations in the MDE tends to impact negatively on the formation and functioning of clusters, especially the dominant clusters in the province.

For the Curriculum Implementers the supervision of the cluster formation process was the easiest task because they used the existing departmental structures (for example, the circuits, the sub-regions etc.) to form clusters. Teachers that fell under one circuit and were teaching at the GET level formed one cluster. This means that if there are 15 schools that are GET, they will meet as a circuit for a specific learning area (Maths or Science). FET level teachers from a circuit also did the same, but separated themselves along specific subject areas (for example; maths clusters were separate from biology clusters and physical sciences clusters etc.). This division between GET and FET teacher clusters constrained the choices teachers had in forming their clusters and networks. For example, teachers across different circuits were not permitted to form a cluster, even when such a cluster would be made up of more likeminded people, friends, or residential neighbours. This point of division was clearly demonstrated by one of the teachers, who was at a school which has both levels of education and who teaches at both levels when she said:

I don't know which workshops should I attend whether FET or GET as I teach both. I prefer to join the FET phase as their schools are nearer to me but they happen to be in another circuit, I need to negotiate with the CI to be transferred. I do not want to spend a lot of money attending cluster meetings, as the department does not pay for our transport

Another complication in the structuring of the Dominant Cluster into FET and GET clusters resulted from the fact that the FET cluster leaders were paid for their work on clusters while the GET clusters were not paid for the same work with teachers. This created serious divisions and perceptions of inequity amongst the teachers.

It seems as if the FET cluster leaders are better and more competent than us, was the way one of the GET cluster leaders captured it.

The number of schools in a cluster varied from three to ten depending on where the schools are situated. In some cases, FET schools were few and isolated and as a result, their cluster meetings consisted of two to three teachers. The dialogue and interaction in these cases were minimal. This was especially so for farm schools and other schools located in the most rural settings. Lieberman and Grolnick (1989) argue that the voluntary participation of teachers promoted the feeling of belonging and ownership. The evidence from the clusters suggests problems with regards to keeping to schedules of meetings and committed engagement from the teachers generally. Here is how one cluster member and leader captured the point:

As *we were the only two high schools in our area , we did not see any need to meet as this was not useful, instead we worked as individuals as before. If I have to meet the other teacher I had to travel more than 25 km. and it means taking two taxis, this was not useful. The CI did not take into consideration the distances between these two schools as he was forming clusters. I sometimes join the primary school clusters but in most cases they do the OBE work. We only met once after the initial formation of clusters but it was not possible after that because of the reason that I have mentioned.*

From the six cluster leaders that I interviewed on the attendance of teachers, they mentioned a concern with the grade 10 and 11 teachers who were not participating in clusters because,

there was little or no content done; as the clusters were mostly engaged in examination questions and tips on drilling learners for the final year question paper. The grade 10 and 11 teachers are really problematic because even if they come, they do not contribute anything said one of the cluster leaders.

The point the cluster leaders were making is that within the phases there were further splits by grade levels created by the activities prescribed for the cluster by the Curriculum Implementer as policy of the MDE. This implies that the grade 10 and 11

teachers who attended the clusters for enrichment on the CK and PCK in order to improve their classroom practices were excluded by the required focus on examinations and improvement of learners' performance. For them the clusters were not catering to their needs and thus their attendance was irregular. This point is confirmed by Cooper, (1989: 51) when he emphasizes that "……when teachers are trapped between what their judgement tells them should be done and what is actually done, and when they see no recourse, they become alienated and disaffected .

When teachers sense that the proposed activities have less to do with how students learn and how they teach them effectively, they absent themselves from such courses and rely on their own inadequate CK and PCK. One of the teachers who participated in both the external and the dominant clusters commented as follows:

I sometimes attend the cluster meetings for MSSI for the sake of the project but I no longer benefit from MSSI clusters as before. They are now more into policies in this project than the subject matter content knowledge that the Japanese professors used to do.

Again, this comment reflects the perception of this teacher on the activities she prefers; and the fact that for her the activities are a main driving force for her commitment and regular attendance.

The issue of boundaries created by the structuring of the clusters for example in circuits, or GET/FET also raises an important concern of the creation of artificial boundaries in knowledge for the teachers. One implication of this division was a perception that FET teachers cannot benefit from the GET teacher and vice versa. This division and artificial boundaries in knowledge and sharing was not only limited to the teacher level and their clusters but also right up to the level of the curriculum implementers who are departmental officials meant to oversee and support the teachers in their development. In one of the meetings the curriculum implementer for GET said, "FET teachers are not going to participate in the GET training because they will not benefit "(CI workshop Nelspruit, June, 2004). This split and boundaries in CK and PCK was again emphasized by the curriculum implementer for FET that "I do not want to lie to you; we have never met with the GET cluster leaders in the region

we feel there is no need; they do their own thing and we do ours." This is a clear indication of the boundary that exists in teachers' thinking on CK and PCK for teaching at the two levels of education. This statement has a great potential of dividing teachers physically and mentally. The spirit of peer learning is indirectly destroyed by these boundaries of knowledge assessed by the phase of teaching at school. It is a pity because some of the teachers teaching the lower grades have reasonable content knowledge sometimes more than some of their FET counterparts which is not available for sharing with peers.

Consider another example on the articulation of this artificial separation of knowledge and the teachers: As stated by one of the education specialists

the *FET teachers should meet as FET teachers because their content knowledge is more advanced than the GET*. It *is further not a good idea to combine the two phases. They will not learn anything from them.*

For this subject specialist, knowledge of the teachers depends on which level they happen to teach not on the levels of education and experience of the teachers concerned. This is a bureaucratic approach to knowledge sharing and clustering that characterized the Dominant Internal Cluster in the Mpumalanga province. The Dominant Internal Cluster, in general, reflected this top down structure that was characterised by segmented operational and functional duties. As discussed earlier, complications were created by the fact that the clusters were expected to function within very strict, and sometimes contradictory, policy guidelines of the MDE.

For training and communication of curriculum policy issues the clusters became ideal if there were issues that needed sent to individual schools, the clusters made it easy for the subject specialists to reduce travel costs. This practice had bad implication of depriving the schools of visits from the curriculum implementers and subject specialists. The curriculum implementers are also classified as FET/GET implementers. This structure as indicated above made their support role easier than visiting individual school. This information was further confirmed by the three Curriculum Implementers who argued that

the presence of the cluster leaders at the schools make our tasks easier and saves us time, instead of visiting all the schools, we visit the cluster leaders and leave instructions.

The major problem occurred when these clusters meet on the same dates because they would not be in a position to know the proceedings of the cluster meeting. One of the curriculum implementers emphasised this point by saying,

cluster leaders should submit their programmes so that I can check on the dates to avoid clashes. I don't want them to do things without me knowing.

This statement provides further evidence on the authority and power that curriculum implementers have on clusters and cluster leaders. Besides the hierarchical organisations and structures of MDE, that duplicated the regional structures, the clusters were left in the hands of Curriculum Implementers whose subject Content Knowledge might not be competitive because of their academic qualification and experience. The survey conducted by JICA (2000) reflected that very few curriculum implementers had university degrees in their subject area. This inefficiency in CK and PCK of curriculum implementers was further confirmed by one of the Regional Director during an interview when he worried that:

CI's who are supposed to be supporting these teachers, are very weak in content knowledge, and some teachers are better than them. The presence of the CI at the school is to show that teachers have support from the region. I prefer collaboration amongst teachers than an outsider. If we use teachers to teach other teachers it will be very useful and effective than sending CI to teach. These teachers on their own can agree on when to meet and how to meet. They should be given a chance to share ideas and new information.

The cluster leaders who in most cases were selected from the schools that participated were tasked with the role of facilitating and managing cluster activities and not so much free to pursue their own subject matter interests. It is quite clear therefore that the dominant clusters were formed for a specific purpose of pursuing and facilitating

the MDE tasks, besides the sharing of CK and PCK with the aim of improving the classroom practices.

Among the many types of clusters identified by the researchers on teacher networks (Lieberman, 1999; Adams, 2000; and Lieberman and Grolnick, 1988); this type of the Dominant Internal Cluster in the province of Mpumalanga can be regarded as an example of the hierarchical structure with top down operations that provide for little or no consultation with the participating teachers. Fullan (2001) warns against this type of structure as, "top down management that hinders progress in organizations" Cochran- Smith and Lytle (1990) also makes the point that, "the key to reform are initiatives managed largely by teachers themselves, and involving dedicated school, time and resources for co-operative experimentation, access to external expertise, participation in local decision making when questions of goals and resources are on the table." I now turn attention to the other type of cluster that operated in the Mpumalanga province, viz. the External Cluster.

4.2.4 External Clusters e.g. The Sibonelo Cluster

The Sibonelo cluster is an example of some of the clusters that exist in Mpumalanga. Most of these clusters are not formally registered by MDE as a result I have called them External Clusters. In order to understand the operation of this cluster, one has to look at the way teachers in this area run their cluster meetings**.** Sibonelo cluster will represent the many external clusters that exist in Mpumalanga. The Sibonelo cluster can be what Fullan, (2001) referred to as a' bottom up' structure. This implies that the structure of this cluster is very strong at the bottom (grass root level) and very weak at the top administrative level. This cluster has its own programme and filled up with activities of their choice and the timeframes that match their needs in the classroom. The schools where the teachers that participate in this cluster come from are more knowledgeable with its existence and its operation. They became knowledgeable because the initial stage of participation on this cluster was shared and accepted by the headmasters of these schools. Teachers from these schools are fully supported by their headmasters; for example, the schools provide flipchart paper, photocopying paper and other resources. The cluster is conducted in a very informal peer relationship and

trust. Every teacher in the cluster has something to contribute; in other words, teachers are the 'experts' of their own learning. Teachers that participate in this cluster rely more on sharing science knowledge and explore the strengths of each other by discussing the, 'how do you teach this concept/topic, While schools accepted the negotiations on participation, teachers were not compelled to attend the cluster meetings. These were done on voluntary basis.

This group of teachers believe that knowledge has no demarcations. They meet as GET and FET teachers to discuss matters of common interest on specific topics. One of the participants commented and said:

Having the limited knowledge of science because of my qualifications, I am being capacitated and improved by the FET teachers that are in our cluster. I knew the basic information on electricity, but the presence of the FET teachers and their contributions have added value in my content knowledge on electricity. This is very good. Guys, we must continue to meet as GET and FET and you have to bear with us slow learners!

This comment at the reflection meeting expressed the inner feelings of a teacher who has benefited and appreciates the work that the cluster is doing. The comment itself is an indication that knowledge cannot be divided and be segmented into knowledge for primary school teachers and knowledge for secondary school teachers. Both teachers can benefit from each other through sharing.

The involvement and the support from the regional office is appreciated if it offered through the invitation. Curriculum implementers cannot simple come without invitation. We had to ask for permission from the cluster members for each visit made to the cluster. Whilst we were there as resource people, our services were never utilised. It was encouraging though to see the Japanese volunteers that are based in the region becoming part of the cluster composition. They were regarded as members of the group although they were not teaching. One of the lessons, on the day of the cluster planning the Japanese volunteer conducted a model lesson on Le Chatiers" principle while the teachers were observing. This process of knowledge sharing and collaboration by the Japanese strengthened their beliefs and attitudes of the cluster members. One of the participants at the workshop commented that:

I have never conducted this experiment before at my school but after seeing Chikusa doing it at this meeting I feel I will do it in my next class. Japanese are good in technology; we are pleased to have them as part of this cluster. We must suck all the information.

It was quite clear that this teacher appreciates and acknowledges the inclusion of the Japanese volunteers in their cluster because of their skills in practical work. The culture of learning from each other as peers becomes the major success of this cluster; especially content knowledge.

There were still few clusters, which despite the rules and regulations on cluster formation from the MDE, were operating outside the parameters prescribed latter by the officials. In these clusters, teachers had organized themselves long before the introduction of the new departmental clusters. As they explained, in our conversations, most of these 'external' clusters existed as an attempt to break the isolation and lack of support from the MDE, since they were mostly located in deep rural setting or in a school where the roads are bad and discouraging to education officials.

There are other critical issues that shaped the clustering of teachers in Mpumalanga province. Many of these issues have to do with locality, content issues, management and structural issues; including historical and personal interests of the teachers. Some clusters or teacher groups as described were in existence before the formal clusters of the MDE. Groups of teachers from these clusters still meet to discuss and share their classroom practices. Some of these groups focus on content knowledge and others on issues of interest. As one of the cluster a member that participates in the external clusters summed it up:

We started our clusters long time ago before the conceptualisation of the MSSI and we have always focused on the subject matter and what happens in the classroom. We had our own plans and programmes, and we called ourselves a zone. The word zone is linked to the area where the circuits are based.

The external clusters are clearly voluntary and based on shared interest among the participating teachers. They have a fairly long history of existence both inside the

province of Mpumalanga and throughout South Africa as I illustrated in Chapter One earlier.

4.3 Summary

This chapter highlighted the conceptualisation of clusters by various stakeholders. The findings confirmed some of the theories from the literature on clusters. Lieberman and McLaughlin, (1991) argued that "networks could be powerful and problematic." In this chapter, I have discussed how powerful the dominant clusters are in the province of Mpumalanga and how these structures for teacher learning and growth can sometimes be bureaucratised and diverted to perform administrative and management tasks of the Department. The bureaucratization of teacher cluster may have an unintended consequence of discouraging the many teachers who wanted an opportunity to improve their CK and PCK through sharing and collaboration with their peers.

The chapter also began to examine the potentialities presented by the alternative clusters (referred to as the external clusters) for teacher growth and development. The point to be made is not so much how the alternative can become the mainstream but more what can be learned from these alternative arrangements of opportunities for teacher learning and growth.