BRIDGING THE GAP
THE CHARACTERISTICS OF A PROFESSIONAL LEARNING COMMUNITY AS A SUPPORT SYSTEM IN SOUTH AFRICA FOR MULTIGRADE TEACHERS AND PRINCIPALS: WORKING TOGETHER FOR COLLECTIVE LEARNING AND ITS IMPLEMENTATION

by

MARTIN LUTHER GOMES

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Supervisors: Dr Jurie Joubert, Prof. Rajendra Chetty

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DECLARATION

I, Martin Luther Gomes, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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Signed **Date**

ABSTRACT

Teacher education for multigrade education in South Africa is poor, since multigrade teachers and principals involved in multigrade education have not received formal training in this form of education, and therefore lack support. Owing to this lacuna in multigrade pedagogy, and teachers' limited knowledge of such pedagogy, multigrade teachers and principals struggle to interpret subject matter and settle for different ways to present and make it accessible to learners. This has a severe impact on the potential of multigrade schools to play an important role as educational units in underserved rural areas.

Research shows that pre-service and in-service training does not enable multigrade teachers and principals to develop a knowledge base within the complexities of the actual classroom situation. Such a knowledge base would enable them to solve the endemic problems of multigrade education, thereby enhancing their task as multigrade teachers and principals. Training can have an impact on trainee teachers, but the successful transfer of this newly acquired knowledge to learners in the classroom is questionable.

Owing to the extent of the problem experienced at each level of multigrade education in the educational system in South Africa, chances are slight that support to multigrade teachers and principals will emanate from officials and curriculum advisers. It is clear that the problem of supporting multigrade teachers and principals is substantial and daunting, and that a solution to the problem will lead to significant advances in learning, or at least a significant reduction in malfunction in the multigrade educational system. Therefore, bridging the gap between newly-acquired teacher competence and teachers' performance in the classroom is a major concern for the future.

This research aims to understand the dilemmas and address the shortcomings as teachers implement new practices within classrooms. There needs to be a transitional process through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in novel ways of education. This research introduces a Professional Learning Community (PLC) as a model of support and guidance to multigrade teachers and principals, bridging the gap between knowledge acquired at a workshop, and concomitant support and guidance, in order to understand and address the dilemmas that emerge as they implement new practices within multigrade classrooms.

This research employs a design research approach to determine design guidelines and principles to facilitate the process of supporting and guiding multigrade teachers and principals, working together as a network cluster for collective learning and its implementation. The research process in design research encompasses educational design

processes and is therefore cyclical in character: analysis, design, evaluation and revision activities are iterated until a satisfying balance between ideals ('the intended') and realisation has been achieved.

To develop solutions for this research, a prototyping approach was employed towards a final deliverable. The Prototyping Phase in this research comprised three cycles, and focused during the evolutionary prototyping process on elaborating on the components of the possible support system to multigrade teachers and principals. It was envisaged that this would concretise the situation, and obviate problems before implementation in the day-to-day user setting. Formative evaluation was applied in order to uncover shortcomings during the development process, in order to generate suggestions for improvement. The results of the evaluation of each preceding prototype were used in the development of the next prototype.

Design research is an effective method of developing various prototypes in collaboration with multigrade teachers and principals to ensure contextual appropriateness of what works at a given time, as well as solutions to the specific problems of multigrade teachers and principals in South Africa.

Keywords: Design research, Educational design processes, Educational design research, Multigrade, Multigrade pedagogy, Network cluster, Professional Learning Community, Support system.

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GLOSSARY

Abbreviations	Explanation
ANA	Annual National Assessment
CBAM	Concerns-Based Adoption Model
CMGE	Centre for Multigrade Education
DBE	Department of Basic Education
DfES	Department for Education and Skills
EFA	Education For All
EPLC	Effective Professional Learning Communities
EQUIP	Education Quality Improvement Partnership
ERP	Education for Rural People
GTCe	General Teaching Council for England
IC	Innovation Configurations
INSET	In-service Education for Teachers
LoU	Levels of Use
MDG	Millennium Development Goals
MGRSI	Multigrade Rural Schools Initiative
NBI	National Business Initiative
NCSL	National College for School Leadership
NPC	National Planning Commission
PLC	Professional Learning Community
PLCA	Professional Learning Community Assessment
PLCI	Professional Learning Community Intervention
R&DCTE	Research and Development Center for Teacher Education
SIP	School Improvement Plan
SoC	Stages of Concern
UNESCO	United Nations Educational Scientific and Cultural Organization
UPE	Universal Primary Education
WCED	Western Cape Education Department
ZPD	Zone of Proximal Development

CHAPTER 1

INTRODUCTION AND OVERVIEW

> "Why does knowledge of what needs to be done so frequently fail to result in action or behaviour that is consistent with that knowledge?" (Pfeffer & Sutton, 2000:4).

This question, exploring one of the greatest mysteries of organisational management, that is, the failure of what needs to be done (knowledge) to result in action or behaviour that is consistent with that knowledge, reflects one of the basic assumptions of this research.

Research (Mulryan-Kyne, 2007:505) shows that pre-service and in-service training do not encourage multigrade (discussed in Section 2.1, Chapter 2) teachers and principals to develop a knowledge base, within the complexity of the actual classroom situation and according to the problems that the multigrade teachers and principals want to solve, which would enhance their task as multigrade teachers and principals. The reason for this disconnection between knowledge and action, according to Dana and Yendol-Hoppey (2008:2-5) and Gravemeijer and Van Eerde (2009:523), is that knowledge, obtained at a workshop, suggests a potential solution for generic learning dilemmas without helping and supporting the multigrade teachers and principals to understand and address these dilemmas that emerge as they implement the new practices within the classrooms.

Furthermore, training ignores a critical foundation that describes the sequence (implementation process) and support necessary for teachers to implement in practice what they have learned in training. This is because policymakers see support, implementation or change as an event and refuse to accept (or ignore) the principle that support, implementation or change is a process – 'a process through which people and organisations move as they gradually learn, come to understand and become skilled and competent in the use of the new ways' (Hall & Hord, 2011:8).

This research aims to bridge the gap between obtaining knowledge at a workshop and supporting and guiding multigrade teachers and principals to understand and address the dilemmas that emerge as they implement the new practices within the classrooms. This bridge focuses on a process through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in the use of the new ways. This research employs a design research approach to determine design guidelines and principles to facilitate the process of supporting and guiding multigrade teachers and principals, working together as a network cluster for collective learning and its

implementation. The research also introduces a Professional Learning Community (PLC) as a model of support and guidance to multigrade teachers and principals.

This chapter first provides definitions of the terms used in this research (Section 1.1). This is followed by this research's importance and value, with the problem presented in context and the rationale given (Section 1.2). The general research questions are introduced in Section 1.3, to be operationalised in Chapters 2 – 7. Next, the research methods and design are briefly discussed (Section 1.4). This chapter concludes with an outline of the remaining chapters that comprise this thesis (Section 1.5).

1.1 Definitions of the terms

The literature employs various terms, such as 'professional learning community', 'design research', 'design principles', 'design guidelines', 'prototypes', 'networking', 'implementation' and 'multigrade teachers and principals'. The definitions of these terms are constantly being debated, but working definitions are presented here to provide a common understanding of use in this thesis:

Professional Learning Community

There is no universal definition for a PLC (discussed in Chapter 3), and educational literature has different definitions and characteristics of a PLC (Morrissey, 2000:4; Bolam, McMahon, Stoll, Thomas, Wallace, Greenwood, Hawkey, Ingram, Atkinson & Smith, 2005:5; Feger & Arruda, 2008:3). For the purpose of this research the declaration of a PLC of Hord (1997) will be used for a concept declaration of a PLC in the context of multigrade education for multigrade teachers and principals committed towards working together in a cluster in South Africa:

> *"...* [A professional learning community may be defined as the] collective learning among staff and the application of the learning to solutions that address students' learning ... [and the] ... physical conditions and human capacities that support such an operation*"* (Hord, 1997:24).

The basis of the concept 'professional learning community' rests with the point of departure that learners' learning is enhanced when there is an improvement in the classroom practice and pedagogy of the multigrade teachers and principals – what teachers need to know and the skills teachers need to command in order to make and justify the many different kinds of decisions which teaching constitutes (Vescio, Ross & Adams, 2008: 82).

Design research

Educational design research, according to Plomp (2009:9), is perceived as the systematic study of the design, development and evaluation of educational interventions, which aim at advancing our knowledge of the characteristics of these interventions and the processes to design and develop them. Plomp (2009:13) also argues that design research is relevant to educational practice as it aims to develop research-based solutions for complex problems. Therefore the starting point for design research is educational problems for which only a few validated principles ('how to do' guidelines or heuristics) are available to structure and support the design and development activities (Kelly, 2009).

Design principles

The aim of design research is to produce knowledge about whether and why an intervention works in a certain context. This type of output is designated 'design principles' or 'intervention theory'. This thesis will use the term 'design principles'. These comprise 'how to do' guidelines or heuristics that enable one to discover or learn something on one's own (Plomp, 2009:13,20). According to Van den Akker (1999), design principles can refer to characteristics of a planned learning design (what it should look like) or its procedure (how it should be developed) and usually take the form of a heuristic statement (Herrington, Herrington & Mantei, 2009). The following format of a heuristic statement of Van den Akker (1999) will guide the design research process for this research:

> If you want to design intervention X for the purpose/function Y in context Z, then you are best advised to give that intervention the characteristics A, B and C [substantive emphasis], and to do that via procedures K, L and M [procedural emphasis], because of arguments P, Q and R.

Design guidelines

These are specific and usually context-dependent rules that must be followed in order to achieve the design principles.

Prototype

It is the first or preliminary form or version of interventions from which other forms are developed or copied (Plomp, 2009:13).

Networking

A group of multigrade teachers and principals interconnected to interact with others in order to exchange information and develop useful contacts.

Implementation

The process through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in the use of new methods and knowledge in their classrooms.

Multigrade teachers and principals

The use of multigrade teachers and principles is a common phenomenon in multigrade schools in South Africa in areas where there are not enough learners to justify the appointment of more teachers. Generally, the principal is also a full-time teacher. This term acknowledges the principal as a teacher.

System

A system is a set of related components that work together in a particular environment to achieve the system's objectives.

In the next section the problem statement and rationale for this research are explored.

1.2 Problem statement and rationale

To help to achieve the Millennium Development Goals set for 2015, the United Nations Educational Scientific and Cultural Organization (UNESCO) launched the Education for Rural People (ERP) as one of the flagships to ensure quality education and the abolishment of inequalities in rural areas (Atchoarena & Gasperini, 2003:20).

In 2002 the ERP asked for collaborative action to address the educational needs of rural people and, owing to isolation and unmotivated multigrade teachers and principals, for professional development of multigrade teachers, where multigrade teachers and principals maintained a closer professional contact with their colleagues. This need was underscored in recent research, conducted in Australia, Bolivia, Burkina Faso, China, France, Greece, Korea, Lesotho, Mali, the Philippines, Tanzania, the former USSR and the former Zaire, by UNESCO, aimed at an analysis and assessment of schools with multigrade classes (Brunswic & Valérien, 2004:9).

The multigrade model of education can provide a viable opportunity for education delivery to help achieve the ERP goals (Atchoarena & Gasperini, 2003:54). The problem is that only a few multigrade teachers and principals in South Africa have undergone training to teach in a multigrade setting or understand multigrade pedagogy (Jordaan, 2008:7).

In 2002 the Western Cape Education Department (WCED) approved a plan, called the Multigrade Rural Schools Initiative (MGRSI), as their contribution to rural upliftment. Unfortunately the initiative was terminated in 2006, leaving the multigrade teachers and principals without assistance and motivation. From this initiative, a variety of empirical data was collected to support further educational actions:

- Multigrade teachers and principals would lose interest if there was no proper maintainable and sustainable support and it would affect the creditability of multigrade education.
- There needed to be mechanisms for regular supervision, monitoring and support at teacher/classroom level (Jordaan, 2008:53).

In spite of a considerable amount of time, energy and money invested in staff development and in-service training during the MGRSI (discussed in Section 2.4, Chapter 2) in the West Coast Winelands, little is known of the effects of the training (Taylor, 2003:195-196). In his case study Boonzaaier (2008:344), focusing on the lessons learned from the MGRSI regarding In-service Education for Teachers (INSET), processes and the impact they possibly had on the improvement of education practices in the multigrade rural schools, identified challenges for future initiatives of this nature:

The training should focus on:

- providing criteria to multigrade teachers and principals to serve as a tool to measure and support the success of their own practices;
- continuous INSET preparation of multigrade teachers and principals to help those unprepared for teaching in multigrade classes, or those needing to be re-trained, to bridge the gap; and
- the principal's pivotal role in the extension of the monitoring and support strategy to be acknowledged and strengthened.

In addition to this problem, the ambitious reforms, developed at the drawing boards in government offices, are often divorced from the problems and issues of everyday practice; therefore multigrade teachers and principals find the implementation of an educational innovation difficult (Benveniste & McEwan, 2000:34-35). This has a severe impact on the potential of multigrade schools to play an important role as educational units in underserved rural areas. Owing to a lack of training of multigrade teachers and principals in multigrade pedagogy, or their limited knowledge of such pedagogy, multigrade teachers and principals

struggle to complete the process of interpreting subject matter and settle for different ways to present and make it accessible to learners.

It cannot be expected of multigrade teachers and principals (who were taught what to teach, how to teach it, when and where to teach it) to suddenly accept responsibility for their own learning in our modern information era (Maker & Nielson, 1995:327). Therefore it is essential that multigrade teachers and principals are supported and exposed to the opportunity of obtaining skills which will allow them to be actively involved with and to manage their own learning process – thus becoming life-long learners, a necessity of our modern society (Bolhuis, 2003:328; Oswald, 2003:1).

There is a need for follow-up support, monitoring approaches and research that speak directly to the problem of practice, that is, how to support the professional development of multigrade teachers and principals, in bridging the gap between knowledge and action that will lead to the development of usable knowledge and skills employable within their unique context (Plomp, 2009:9).

The Centre for Multigrade Education (CMGE) of the Cape Peninsula University of Technology in Wellington was established in 2009 through a grant from the Royal Netherlands Government to enhance the development of multigrade education solutions and to develop the capacity to make a significant difference in the chances of success for rural primary school children. The CMGE took a leadership role in South Africa in addressing the factors (Table 1.1), based on the in-depth studies and research of the National Planning Commission (NPC) (2011), that contribute to poor school outcomes for learners in South Africa and in advancing the cause of rural education and serving as a resource to local, tribal, state and national entities to further educational achievement in rural communities (Centre for Multigrade Education, 2012).

Table 1.1: Factors that contribute to poor school outcomes for learners in South Africa (National Planning Commission, 2011:14-15)

Factors or problems within the education system itself.	• The ongoing changes and amendments to curricula. • The type of teacher training. • Inadequate support to teachers. • Teaching time compared with other activities. • The availability of learning and teaching materials such as textbooks.
Complex issues playing a role in the quality of education.	• Curriculum design. • Language issues. • The use of technology. • The efficacy of the bureaucracy. • The balance of power between parents, schools and the bureaucracy. • High levels of violence against women and children. The main problems lie in: • Teacher performance. • The quality of school leadership.
Factors that contribute to poor school outcomes for learners in South Africa.	• Teachers spend too little time in contact with learners. • They possess inadequate subject knowledge and lack basic pedagogical ability. • Teachers are poorly supported by the administration within education departments. • Sporadic provision of books and other learning materials. • Several efforts to upgrade teachers' skills have been largely ineffective.

The main aim of the CMGE was to roll out the multigrade education project to transfer knowledge and skills to multigrade teachers and principals to empower children in rural and multigrade schools to be able to compete on a par against educational benchmarks (Centre for Multigrade Education, 2012). The multigrade schools in the Western Cape were used as a springboard to launch the Centre's programmes and projects. The programmes and projects were tested on a small scale and it was envisaged that they would be deployed to other districts/provinces according to the design research approach.

The work of the Centre was based on its occurrence through a specific intervention. The intervention would be driven by a design research approach in order to improve instruction, through collaboration and capacity building, of the practitioners in multigrade schools. This collaboration enhanced the possibility that the intervention would indeed become practicable within and relevant to the multigrade educational context, thereby increasing the probability of successful implementation in multigrade classrooms.

To summarise, teacher education for multigrade education in South Africa is poor and most multigrade teachers and principals involved in multigrade education have not received official training in multigrade education. In consequence, they experience a lack of training and support in respect of multigrade education. Owing to the extent of the problem at each level of multigrade education in the educational system in South Africa, chances are slight that support to multigrade teachers and principals will come from officials and curriculum advisers (Centre for Multigrade Education, 2009:46). It is clear that the problem of supporting

multigrade teachers and principals is substantial and daunting, and that a solution to the problem will lead to significant advances in learning (or at least a significant reduction of malfunction in the multigrade educational system).

Aims of this research

The aim of this research was to identify and understand the characteristics of a PLC and its utilisation as a practical support system to provide multigrade teachers and principals with practicable opportunities. These should guide the interaction and collaboration of multigrade teachers and principals. The focus was on multigrade teachers and principals functioning as a PLC, as well as on the implementation of collective learning in the classroom.

The aims of the research were therefore twofold:

1. To identify characteristics and design guidelines of a PLC, as a practical support system for multigrade teachers and principals, collaborating as a network cluster.

2. To enhance and optimise the process of collective learning and its implementation in their day-to-day user setting, their classrooms.

The first aim was achieved by consulting existing literature surrounding the documented characteristics of a PLC, as a practical support system for multigrade teachers and principals, working together as a network cluster. This was followed by a micro-evaluation of how to achieve optimal conditions for the use of the support system in the South African multigrade context. The data were generated through evaluation of the support system prototypes. The processes the multigrade teachers and principals employed to transform the support system into planning and action for working together as a network cluster for collective learning were also investigated for adaptation for multigrade teachers and principals in multigrade schools in South Africa. The process culminated in the development of design principles and guidelines for a practical support system based on the literature review and data generated through successive cycles of design, implementation and evaluation of the support system prototypes.

The second aim was achieved by using a design research approach to enhance and optimise the process of collective learning and its implementation in classrooms. The focus of the design process shifted from contextualising the system, through establishing conditions for use of the support system, to establishing finally how multigrade teachers and principals used the support system (PLC) to work together as a network cluster for collective learning and its implementation in classrooms.

The primary focus of this research is to enhance the support system for multigrade teachers and principals and to identify the associated design principles and guidelines to facilitate use of the support system. This research includes both the identification of the optimal conditions for use of the support system that multigrade teachers and principals require to function as a PLC, as well as the study of the processes in a PLC for transforming the support and guidance into action. The development of a support system and relevant design principles and guidelines may cascade into a change of multigrade teachers' and principals' interaction, collaboration and its implementation in the complexity and context of the actual classroom situation, and according to the needs they want to address. This research may contribute to eradicating the lacunae in the wider South African multigrade context, between teachers and principles obtaining knowledge at a workshop and concomitant support and guidance which will enable them to understand and address the dilemmas that emerge as they implement the new practices in the classrooms.

1.3 Research questions

The general research questions are presented in this section, to be operationalised in Chapter 2 and explored further based on the literature review and conceptual framework. The overall research question is:

- What are the characteristics of a professional learning community as a means of supporting and guiding multigrade teachers and principals, working together in their day-to-day user setting as a network cluster for collective learning and its implementation in multigrade classrooms in South Africa?

Characteristics refer to the factors and an approach that should be present in a support system in order to establish a predisposition for support and guidance to become learning organisations. These factors refer to the way of thinking and interaction in an organisation, while approach refers to the norms of collaboration and participation in a context that supports multigrade teachers and principals in their professional endeavours and collaborative efforts (Hall & Hord, 2011:22, 26). This should be a support system that fosters:

- a solid foundation, consisting of a collaboratively developed and widely shared mission, vision, values and goals;
- collaborative teams that work interdependently to achieve common goals; and
- a focus on results as evidence by a commitment to continuous improvement and implementation.

A PLC refers to the professional staff in schools learning together to direct efforts toward improved learner learning in classrooms. Network cluster in this research refers to the concept of multigrade teachers and principals, with a shared understanding and common values, who work together to attain what they cannot attain on their own; thus an environment is created which cherishes communal co-operation, emotional support, personal growth and learning. Implementation refers to the process through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in the use of new methods and knowledge in their classrooms.

In order to address the overall research question, it is necessary to examine a number of specific sub-questions. In this research there are six sub-questions:

1. What are the current needs, problems and challenges that multigrade teachers and principals face in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting?

To improve the current situation, properly supported opportunities for their specific stage or level of difficulty should be identified. Research sub-question 1 is addressed in Chapter 2.

2. What is a professional learning community and how has the concept developed?

3. What are the distinctive characteristics of a professional learning community?

Sub-questions 2 and 3 help to identify the existing knowledge and essential characteristics of a PLC that have to be incorporated in the design of the optimal support system for multigrade teachers and principals. This information provides the basis for the global or overall design of a PLC as a support system. Research sub-questions 2 and 3 are the focus of Chapter 3.

4. What pre-existing conditions need to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that support and guide this interaction and collaboration?

Once the documented characteristics of an optimal support system are identified in the literature, it is necessary to establish how to optimise the various components of a PLC as a support system. Sub-question 4 helps to investigate how the optimal conditions for use of the support system can be established. Research sub-question 4 is the focus of Chapters 5 and 6.

5. How effective is the support system in practically supporting and guiding multigrade teachers and principals?

This question brings the research to the actual application of the process of practice, as opposed to the theories relating to it, and to what extent the support system is transformed into action and, consequently, to ultimate improvement. In order for a support system to be effective, it must have a measurable impact on the quality of:

- the interaction and collaboration of multigrade teachers and principals in developing a shared mission, vision, values and goals;
- working interdependently in collaborative teams to achieve common goals; and
- the evidence of the process of collective learning and its implementation in their day-to-day user setting, the classroom.

Evidence of changes in interaction and collaboration, working interdependently in collaborative teams, and collective learning and its implementation was documented through questionnaires, observations and interviews. Research sub-question 5 was addressed in Chapter 7.

6. Which design guidelines for the development of an effective support system intervention for practically supporting and guiding multigrade teachers and principals can be identified?

The purpose of this research is therefore to ascertain how the current situation in multigrade education in South Africa can be improved by providing multigrade teachers and principals with properly supported opportunities that support their interaction and collaboration. Therefore, it is essential that there is a wider impact than this specific research and context. Design principles and guidelines are required to identify the characteristics of an effective support system to address the main research question and contribute to the body of knowledge on supporting and guiding multigrade teachers and principals. In order to provide a basis for transferability of this research to different multigrade contexts in South Africa, design principles and guidelines are identified from the design research process for use in other multigrade contexts. Research sub-question 6 is addressed in Chapters 3 and 5 and 8.

1.4 Research methodology

This research fits into the pragmatism paradigm. Pragmatists see the problem as most important and researchers focus their attention on the research problem and use pluralistic approaches to derive knowledge of the problem. For this research, the pragmatism school of thought about knowledge opens the door to multiple methods (one of the characteristics of pragmatism), different assumptions, as well as to different forms of data collection and analysis that allow for knowledge claims that arise from actions, situations and

consequences, and that are based on what works at the time and solutions to specific problems for multigrade teachers and principals in South Africa.

The purpose of this research is not to prove what the problems are, but to identify the problems and to see how the current situation in multigrade education in South Africa can be improved. In order to achieve the aims and objectives of this research, the researcher applied educational design research as the most appropriate design to address the research question. According to Kelly (2009:75-76), design research is recommended in educational settings when one or more of the following conditions operate to make the problem more 'wicked' and open than simple and closed, for example:

- "when the content knowledge to be learned is new or being discovered even by the experts;
- when how to teach the content is unclear: pedagogical content knowledge is poor;
- when the instructional materials are poor or not available;
- when the teachers' knowledge and skills are unsatisfactory;
- when the educational researchers' knowledge of the content and instructional strategies or instructional materials are poor; and
- when complex societal, policy or political factors may negatively affect progress" *(*Kelly, 2009:76).

Educational design research, according to Plomp (2009:9), is perceived as the systematic study of designing, developing and evaluating educational interventions which aim at advancing our knowledge of the characteristics of these interventions and the processes to design and develop them. Design research projects strive towards two types of main results. The first main aim comprises high-quality interventions (such as programmes, products and processes) designed to solve complex educational problems, and the second main aim of design research is the accompanying set of well-articulated design principles and guidelines that provide insight into the:

- purpose/function of the intervention;
- key characteristics of the intervention (substantive emphasis);
- guidelines for designing the intervention (procedural emphasis);
- implementation conditions; and
- theoretical and empirical arguments (proof) for the characteristics and procedural guidelines (Nieveen, 2009:89).

The research process in design research encompasses educational design processes and is therefore cyclical in character: analysis, design, evaluation and revision activities are iterated until a satisfying balance between ideals ('the intended') and realisation has been achieved (Plomp, 2009:13). To develop solutions for this research a prototyping approach was employed towards a final deliverable. The Prototyping Phase in this research comprised three cycles and focused during the evolutionary prototyping process on elaborating the parts or components of the possible support system for multigrade teachers and principals to a concrete level and ironing out implementation problems before use in their day-to-day user setting. Formative evaluation was applied in order to uncover any shortcomings of a prototype during its development process with the purpose of generating suggestions for improving it. The results of the evaluation of each preceding prototype were used in the development of the next prototype. Nieveen (2009:90) refers to this refining process as evolutionary prototyping.

1.5 Structure of the thesis

The development research activities and findings of this research are presented in the subsequent chapters.

- Chapter 2: Literature review: Support challenges for multigrade education

This chapter addresses research sub-question 1. The aim of the chapter is to provide information about the concept of multigrade education, the place of multigrade education in providing schooling for children in rural areas, the challenges of multigrade education, professional development provided to multigrade teachers and principals teaching in multigrade schools, how multigrade teachers and principals facing these challenges are supported, and the current needs, situation, problems and challenges in supporting multigrade teachers and principals in South Africa.

- Chapter 3: Literature review: a conceptual framework for professional learning communities

This chapter addresses research sub-questions 2 and 3. The aim of the chapter is to provide information about the concept PLC and the characteristics of a PLC in supporting and guiding multigrade teachers and principals. This chapter also introduces the conceptual framework that guided this research, and interpretation of the findings.

- Chapter 4: Overview of the research design

The aim of this chapter is to provide information about how the research question and sub-research questions will be investigated. This chapter introduces the research paradigm and

educational design research as a research approach suitable to address complex and 'wicked' problems in educational practice for which no clear guidelines for solutions are available. It also introduces the reasons why educational design research is suitable for addressing the problems of multigrade education in South Africa, and how design research is applied to this research.

- Chapter 5: Preliminary Phase – Needs and context analysis

This chapter addresses research sub-questions 1 – 3. The aim of this chapter is to provide information about the Preliminary Phase that focuses on conceptualising the PLC, as a support system to multigrade teachers and principals, and defining the design specifications of a PLC. This chapter elaborates on how design principles and guidelines, necessary for the optimised support system for multigrade teachers and principals, in this phase, were generated. It also introduces the design principles and guidelines for the first support prototype, derived from the proposed principles and guidelines from the MGRSI, the case study, the baseline study, the questionnaire and the focus group interview, along with the principles and guidelines from the literature review.

- Chapter 6: Prototyping Phase: Establishing conditions for use (Cycle 1 – 2)

This chapter addresses research sub-question 4. The aim of this chapter is to establish conditions for the use of the support system for multigrade teachers and principals.

The chapter explores the development of two successive prototypes of a PLC, both of which were formatively evaluated to inform the development of the next prototype. Two design prototypes were developed and evaluated.

- Chapter 7: Prototyping Phase: Transforming conditions for use (Cycle 3)

This chapter addresses research sub-question 5. The aim of this chapter is to establish how conditions of use are transformed into use by multigrade schools and whether the characteristics of a PLC actually support and guide multigrade teachers and principals. It takes a closer look at the research design and results for the third design cycle employed during the Prototyping Phase, documenting the fourth and final prototype for this thesis. Sub-question 4 is also explored for the final prototype.

- Chapter 8: Conclusions and recommendations

The final chapter presents a summary of the findings of this research and the conclusions to be drawn. Conclusions and recommendations are presented, along with a discussion of the possible effects of these findings on policy, practice and research. The chapter therefore

addresses the overall research question. The limitations of this research are explored along with recommendations for further research.

1.6 Conclusion

This research shows that a PLC support system can positively mediate and influence the interaction and collaboration of multigrade teachers and principals with properly supported opportunities for collaborating as a network cluster for a period of time on their own without the help of an external source. The design principles and guidelines of the PLC support system of this research supported and guided them with the steps they needed to follow to create their own infrastructure and platform for planning and collaboration to share their prior knowledge and experience, as well as their experience with regard to the implementation of the new knowledge.

The PLC support system model of this research also provides the opportunity for process-generating design principles that can be employed by other researchers, officials, teachers and principals wishing to develop or adopt an effective support system in schools.

CHAPTER 2

LITERATURE REVIEW: SUPPORT CHALLENGES FOR MULTIGRADE EDUCATION

> In 2000 it was estimated that 562 million primary age children were enrolled in primary schools in developing countries, 62,3 million in developed countries and 11.1 million in countries in transition. A conservative estimate of 30% of children currently in multigrade classes in all countries yields a world total of 192,45 million. Add this to, say 50% of the currently out-of-school children for whom opportunities to learn are most likely to occur in multigraded class. This generates an additional 52 million children. This totals 244,45 million children worldwide for whom a multigrade pedagogy is likely to be the one through which they learn in primary school (Little, 2007:7).

The first research sub-question is addressed in this chapter: What are the current needs, problems and challenges that multigrade teachers and principals face in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting? This chapter discusses the concept 'multigrade education' and the place of multigrade education in providing schooling for children in rural areas (Section 2.1), the challenges of multigrade education and professional development for teachers teaching in multigrade schools (Section 2.2), how teachers facing these challenges are supported (Section 2.3), and the current needs, situation, problems and challenges in supporting multigrade teachers in South Africa (Section 2.4).

2.1 Multigrade education

In the drive to meet the Education For All (EFA) and the education-related Millennium Development Goals (MDG), countries have been grappling with the best and most cost-effective ways of providing quality education to their citizens before the end of 2015 for both EFA and MDG (Jordaan & Joubert, 2008:1). However, there are still countries that may not meet the cherished goals of Universal Primary Education (UPE). This is especially true in rural areas where settlement is sparse. Such countries will find it economically challenging to open schools and to recruit, train and deploy teachers in areas where there are fewer learners to attend schools (Jordaan & Joubert, 2011b:38).

It may be argued, on economic grounds, that it is more feasible to invest in areas where there are sufficient numbers of learners to justify the expenditure. While a wiser use of meagre resources is understandable based on economic arguments, social equity and fair distribution of resources among the citizens of a country demand that educational opportunities be spread in all areas of the country, irrespective of the size of settlements. This is essential and sensible in the long run as it promotes social cohesion and a feeling of inclusion among all the nationals of a country (Jordaan & Joubert, 2011b:38).

Therefore, the provision of education to sparsely populated areas and pastoral communities is an issue of concern to countries that have such citizens. The idea of multigrade education has emerged from such a need to cater for small settlement areas and mobile populations (Jordaan & Joubert, 2011b:38).

Multigrade education is a common phenomenon in primary school education in many countries and is seen as a solution to the problem of providing schooling for children in rural areas (Brunswic & Valérien, 2004). According to Mulryan-Kyne (2005:1), traditionally, the most favoured option in primary school systems throughout the world has been the singlegrade or monograde class structure where children are grouped into classes according to a narrow age band.

Generally the bringing together of large groups of same-age children for instruction by one teacher in one classroom was held to be the most administratively and economically expedient way of providing education for the maximum number of children. However, the majority of small schools in developing countries are multigrade because of circumstances rather than choice (Blum & Diwan, 2007).

Multigrade education, according to Little (2005:4) is commonly found:

- in impoverished rural communities;
- in areas where there are not enough learners to justify the opening of monograde classrooms to teach only one grade level per classroom;
- in areas where the learner and teacher numbers are declining and where there was previously monograde teaching;
- in areas where parents send the learners to more popular schools within reasonable travelling distance, leading to a decline in the potential population of learners and teachers in the less popular schools;
- in mobile schools in which one or more teachers move with nomadic and pastoralist learners, spanning a wide range of ages and grades; and
- in schools, in which learners are organised, for pedagogic reasons, in multigrade rather than monograde groups, and often as part of a more general curriculum and pedagogic reform of the education system.

The term 'multigrade education' is not universal, but the practice is widespread. Given the range of contexts in which multigrade education occurs, it is likely that multigrade organisation and teaching practices will vary both within and among countries. Many terms are found in the literature to describe multigrade settings. Little (1995) also uses the terms

'multilevel, multiple class, family class and unitary school' to describe classes with more than one grade level. Russell, Rowe and Hill (1998) and Veenman (1995) include the terms 'composite' or 'combination' classes, 'double' classes, 'split' classes, 'vertically grouped' classes and 'blended' classes.

For the aim of this research the researcher will use the definition below of Jordaan and Joubert (2011b:12) and the Centre for Multigrade Education (2009:20) as a working definition for the concept 'multigrade education', since Jordaan and Joubert of the Centre are considered prominent scholars and authorities on multigrade education in a South African context, owing to their involvement in the field of multigrade education in South Africa since 2000. Their declarations best describe the current multigrade situation in South Africa.

Multigrade education is a scheme in which, according to Jordaan and Joubert, 2011b:12:

- One teacher handles learners in the same class, at the same time (usually at the primary level), at various grade (two to three) levels for an entire school year.
- Grades retain their separate existence.
- Each learner is expected to transact only the curriculum fixed for his/her grade while sharing teaching time and a classroom with learners of other grades.

The Centre for Multigrade Education (2009:20) refers to multigrade classrooms as a:

> … place in rural areas, with limited facilities, mostly on farms, where one teacher, often of a different culture, teaches simultaneously all the learning areas or some of the learning areas at the same time to learners often of different cultures and different languages, which are in two or more grades, in the same phase, or in different grades in a combination of different phases.

The process of delivering and providing education in rural areas, small settlements and mobile populations did address the problem superficially by getting learners into the school building, but it created a new problem that obstructed the provision of education. Since there are not enough learners to justify the opening of monograde classrooms to teach only one grade level per classroom, and limited facilities, a teacher must handle and teach learners that are at various grades (two to three) in one classroom at the same time for an entire school year – a pedagogy that most teachers do not know or in which they have not received any training.

Pedagogy is the act or science of teaching – it is what a teacher needs to know and the skills a teacher needs to command in order to make and justify the many different kinds of decisions of which teaching is constituted (Alexander, 2004:11). Watkins and Mortimer (1999) define pedagogy as "any conscious activity by one person designed to enhance

learning in another". Multigrade education, with its unique grouping of learners requires a different pedagogy from monograde pedagogy.

According to the Curriculum Reform Implementation Project (2011:6), supporting the implementation of the Primary Reform Curriculum in Papua New Guinea, multigrade education is not a pedagogy where one teacher moves between two classrooms to teach two separate grades with separate programmes, or where two classes working in isolation in the same room, seated at each end of the classroom, are taught separate programmes by one teacher. In multigrade education:

- there are not two or three separate programmes. The curriculum for the combined grades is integrated, that is, common elements from the different year programmes are combined into one programme for the class; and
- the needs of the learners determine the teaching and learning and therefore the learning is learner centred, not grade level centred. This gives learners, through the different levels of activities provided by the teacher, the opportunity to work at their level of ability (Curriculum Reform Implementation Project, 2011:6).

According to Pincas (2007), successful multigrade classes, in order to foster pedagogy that "enhances learning in another", must be characterised by:

- effective peer instruction;
- self-directed learning;
- the development of learning to learn skills;
- exposing learners to work at other levels;
- learners doing constructive work while waiting for the teacher's attention; and
- adequate resources to cope with the needs of different groups.

The fact that the majority of small schools in developing countries are multigrade schools by nature and are seen as inferior and cheap options, rather than as valuable resources for providing quality education in rural areas (Blum & Diwan, 2007:2), does not help to solve or reduce the problem.

2.2 The challenges of multigrade education and professional development to teachers teaching in multigrade schools

Little (2007:7-8) acknowledges the value of multigrade education that promotes quality in her argument that for learners to learn effectively in multigrade environments, teachers need to

be well-trained, well-resourced and hold positive attitudes to multigrade education. However, many teachers in multigrade environments are either untrained or trained in monograde pedagogy, have few if any teaching/learning resources, and regard the multigrade classroom as the poor cousin of the better-resourced monograde classrooms found in large urban schools and staffed by trained teachers.

Furthermore, the concept of multigrade pedagogy is quite challenging for untrained multigrade teachers or multigrade teachers trained in a monograde pedagogy; also, multigrade teachers find multigrade education difficult (Khan & Khan, 2008:1).

Therefore multigrade teachers find the implementation of an educational innovation difficult because they must change the core of educational practice – a pedagogy the multigrade teachers do not know or in which they did not receive any training or support (Benveniste & McEwan, 2000:34-35). This has a severe impact on the potential of multigrade schools to play an important role as educational units in underserved rural areas.

Multigrade schooling challenges multigrade teachers to re-think the way the curriculum is delivered and to consider different pedagogies. Unfortunately, because of the lack of pre-service and in-service training programmes to provide adequate guidance and support for multigrade teachers on how to attain academic knowledge on the theory and practice of most multigrade education, multigrade teachers feel that they do not have the necessary skills to handle several grade levels at the same time (Little, 2005:16).

It is evident that the problem is more than just the fact that teaching in a multigrade classroom requires a pedagogy that is different from monograde pedagogy. The teachers in multigrade schools must be provided with adequate knowledge of and training on how to handle several grade levels at the same time. Therefore training and in-service teacher education programmes need to prepare, guide and support multigrade teachers to build a knowledge base that enables them to have a thorough understanding within the complexity of the actual classroom situation and to help them use a variety of teaching strategies in a multigrade context (Lingam, 2007:187).

The solution of addressing the issue of providing teachers with adequate knowledge, skills and training creates further barriers to the process of delivery and the execution of the pedagogy in order to provide education to sparsely populated areas and pastoral communities.

Research (Aryal, Neupane, Laudari & Bhattarai, 2003:12; Lingam, 2007:191; Mulryan-Kyne, 2007:505) shows that pre-service and in-service training does not encourage multigrade teachers to develop a knowledge base, within the complexity of the actual classroom

situation, and according to the problems that the multigrade teachers want to solve, which would enhance their tasks as multigrade teachers. The reason, according to Dana and Yendol-Hoppey (2008:2), is because historically, the most dominant model of developing and training the professionals (human resources) within a school, has taken the form of workshops conducted by external sources.

DuFour and Berky (1995:5), Henning, Van Rensburg and Smit (2004:13-14), Kelly, Lesh and Baek (2008:246-248), and Gravemeijer and Van Eerde (2009:511) support the above-mentioned tendency and argue that the reason for this is that this type of training model on the development of professionals within a school often turns participants into passive recipients of information without a "deep learning" and understanding of the real strategy, practice or change.

According to DuFour, DuFour, Eaker and Many (2006:6), a further impact of this type of training model on the development of professionals within a school for the improvement of that school, is that it leads to one of the great mysteries of organisational management – the failure of what needs to be done (knowledge) to result in action or behaviour that is consistent with that knowledge.

Joyce and Showers (1988) support the argument of DuFour *et al.* (2006) by showing the impact of this disconnection between knowledge and action on the teacher's learning and use as illustrated in Table 2.1 below:

Table 2.1: Disconnection between knowledge and action on teacher-learning (DuFour *et al*., 2006)

Training Components	Concept Understanding	Skills Attainment (Mechanical use)	Application (Executive use)
Modelling by Trainer(s)	85%	18%	5 – 10%

A study to improve schools in a multigrade situation in Chitral-Pakistan (Khan & Khan, 2008:12) and Nepal (Suzuki, 2007:87) found that in the centre-based workshop, teachers accept change, and gain knowledge and competence, but seldom implement it at actual classroom level. According to Suzuki (2007:100), the key problem (Table 2.2) is that the teachers do not know how to actualise this change in their classrooms, because they do not know how to bridge the gap between newly acquired teacher knowledge and skills and their performance in the classroom.

Table 2.2: The scope of the impact of the training (Suzuki, 2007:100)

Result of training	**Impact on classroom**
Knowledge gained by trainees	Change
Competence gained by trainees	Change
Classroom performance by trainees	Little change
More learning time for their students	No change

The reason for this disconnection between knowledge and action, according to Dana and Yendol-Hoppey (2008:2-5) and Gravemeijer and Van Eerde (2009:523), is because knowledge, obtained at a workshop, suggests a potential solution for generic learning dilemmas without helping and supporting the teachers to understand and address these dilemmas that emerge as they implement the new practices within the classroom.

Furthermore it ignores a critical foundation that describes the sequence (implementation process) and support necessary for people to implement in practice what they have learned in training (Figure 2.1). This is because policymakers see support, implementation or change as an event and refuse to accept or ignore the principle that support, implementation or change is a process – "a process through which people and organizations move as they gradually learn, come to understand, and become skilled and competent in the use of the new ways" (Hall & Hord, 2011:8).

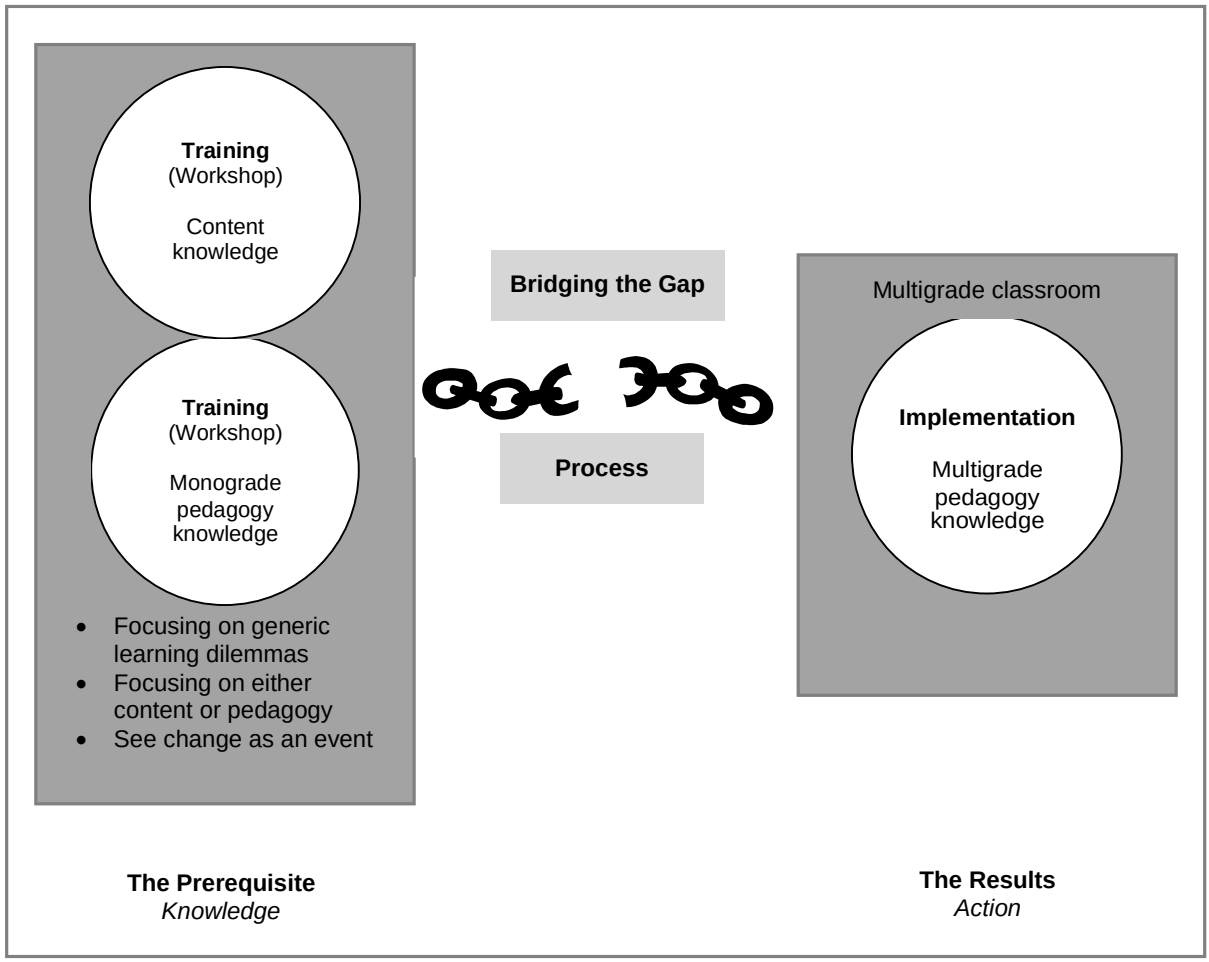


Figure 2.1: Disconnection between knowledge and action (Mishra & Koehler, 2006:1021-1022)

Therefore the delivery and execution of the pedagogy must take the process, through which the teachers and schools move as they gradually learn, come to understand and become skilled and competent in the use of the new ways, into consideration. To be able to realise this process, according to research, the following aspects should be taken into consideration:

- The complexity of the actual classroom situation of the teachers and the unique problems the teachers want to address.
- The role the teachers, as active participants, play in their own learning and understanding of the real strategy, practice or change. Wenger (1998) refers to this kind of learning and understanding as knowledge generated in practice ('owned in practice'). Dana and Yendol-Hoppey (2008:2-3) support Wenger's argument, but distinguish between:
    - knowledge *for* practice (knowledge suggests a possible solution to a generic situation, policymakers do not take the unique situation of the teacher into account);
    - knowledge *in* practice (acknowledges the teacher's practical knowledge of the classroom situation. A senior teacher or a guardian evaluates the lesson of the teacher, applies new knowledge and ideas, and reflects on it)*;* and
    - knowledge *of* practice (knowledge is obtained from data from systematic enquiry and questions. Knowledge helps teachers to determine which factors have a positive or a negative effect on learning in their classrooms and throughout the school); and
- the support teachers need to implement obtained knowledge and skills at actual classroom level that is consistent with that knowledge and those skills (Mulryan-Kyne, 2007:505).

The impact of this disconnection between knowledge and action, if not addressed, according to Hall, Dirksen and George (2006:43), is that once teachers close their classroom doors, they alter an innovation so that it better meets their needs within the complexity of their actual classroom situation and the unique problems they want to address. Because of this tampering, the fidelity of the implementation is decreased to the point that the critical attributes of the innovation are no longer being implemented.

Findings of researchers of the Concerns-Based Adoption Model (CBAM) support the above-mentioned tendency: although team-teaching and instructional models showed that most teachers believed that they were using the innovation, they only used parts of the innovation and in a different way (Hord, Stiegelbauer, Hall & George, 2006:4).

The above-mentioned arguments, statements and research make it clear what the challenges of professional development, in the form of training and in-service teacher education programmes, are to teachers in multigrade schools. Support in the form of workshops and training does not solve the problem, neither, after the requisite analysis, does it provide solutions.

The reason for these shortcomings could be that researchers and policymakers only identify the problems, with little insight into and contributions towards improving practice or informing decision-making and policy development in the domain of education. If research and policymakers only focus on identifying the problems, informing decision-making and policy development in the domain of education will almost always focus on knowledge for practice, without distinguishing between knowledge *for* practice, knowledge *in* practice and knowledge *of* practice. Furthermore, teachers are almost never given the opportunity to create their own meaning, learning, and understanding of the new strategy or intervention (Thompson, Gregg & Niska, 2004:4).

Therefore teachers consider professional development a waste of time because a shotgun approach has been used to introduce teachers to new ideas from outside without their input; frequently there is also no follow-through or support to implement the innovation or new strategy (Chrispeels, Andrews & González, 2007:800).

It is understandable that teachers involved in multigrade education struggle to keep their heads above water. What was supposed to be a solution to the problem of providing schooling for children in rural areas, has created a chain of more problems and challenges for teachers teaching in multigrade schools – with a severe impact on the potential of these schools to play an important role as educational units in underserved rural areas.

Instead of a possible solution, generated by an external source imposed upon them, multigrade teachers and principals should be allowed to create, as active participants, new knowledge and be given the opportunity to be involved in their own learning, creation of meaning and understanding of the new strategy, with the necessary follow-through or support to implement it (Knowles, 1975:18). Without their active participation in the whole process, they will be more isolated from support and guidance within a multigrade context.

Teachers, who were taught what to teach, how to teach it, and when and where to teach, should be supported and exposed to the opportunity to obtain skills which will allow them to be actively involved with their own learning process and to manage their own learning – thus becoming life-long learners, a necessity for our modern society (Oswald, 2003:1).

Therefore professional development should focus on a process of support through which people and organisations move as they gradually learn, come to understand, and become skilled and competent in the use of new ways, ensuring growth, improvement and support for the community and its members (Dana & Yendol-Hoppey, 2008:2-5).

2.3 Support to multigrade teachers

Unfortunately little evidence is available in the international literature relating to a process of support and preparing teachers and schools as they gradually learn, come to understand, become skilled and competent in the use of new ways, ensuring growth, improvement and support in a multigrade context. A reason for this, according to Little, Pridmore, Bajracharya and Vithanapathirana (2006:1), is that in most countries teacher education for multigrade education either does not exist at all, is not embedded in their teacher education curricula or is offered as part of in-service training. Many of the in-service training programmes in multigrade education adopt a cascade model of dissemination and therefore are subject to many of the effectiveness issues that face cascade training programmes in general (Little, 2005:17).

Only a few examples of pre-service teacher training courses that address multigrade education exist (Little, 2005:16). In Finland multigrade education is embedded in teacher education curricula, while in England multigrade teachers express the desire for in-service training and curricula support for the multigrade class, but generally have to rely on their training in the principles of diversity and differentiation in coping with the demands of the multigrade class (Little, 2005:17).

Vinjevold and Schindler (1997:145) report that a study by Veenman and Raemaekers (1995) was the only detailed study found in the international literature relating to the long-term effects of a staff development programme for teachers in multigrade classes. Research was done by Veenman and Raemaekers (1995) in the late 1980s in schools in The Netherlands with multigrade or mixed-age classes to ascertain if teachers, who followed the staff-development programme, still used the target behaviours after two and five years and if the training had a lasting effect on the time-on-task of the learners.

Veenman and Raemaekers found that the support structures achieved positive changes in staff development programmes (Table 2.3), and improved teaching effectiveness through gaining instructional skills. They improved the way in which teachers organised instruction, adapted instruction to the learners' needs, and refined classroom management skills (e.g. use of material/space and dealing with disturbances). Time-on-task levels for the learners were also more positive, and target teaching behaviours were demonstrated. However the teachers used the skills for only a period of time, and their teaching effectiveness and

instructional skills quickly diminished to the level of the pre-training baseline (Veenman & Raemaekers, 1995:24-25).

Table 2.3: Short- and long-term effects of staff development programmes (Veenman & Raemaekers, 1995:20-24)

Trained teachers	
Short-term effects	**Long-term effects – After two and five years**
• Gains in instructional skills were found. • The way in which teachers organised instruction improved. • The way in which teachers adapted instruction to the learners' needs improved. • Classroom management skills (use of material/space and dealing with disturbances) improved. • Time-on-task levels for the learners improved.	• Target teaching behaviours were demonstrated. • Target skills appeared to have been transferred and sustained over time. • No difference found in implementation rates between teachers trained two years ago and those trained five years ago. • No significant achievement differences were found in the classes with trained versus untrained teachers.

The reason for teaching effectiveness and instructional skills to diminish to the level of pre-training baseline was due to the fact that the coaching had little or no effect on supporting the teachers. According to Veenman and Raemaekers, this decline might have been due to numerous factors: a perceived lack of success with the skill, the constraints of the complex work environment associated with a multigrade class, and a lack of support in promoting teaching effectiveness and instructional skills (Veenman & Raemaekers, 1995:24).

The relevance of the research by Veenman and Raemaekers (1995:24) is that they focused on the process of supporting teachers' teaching and the effects of this support on the multigrade teachers. They concluded that in future greater attention should be paid to transfer strategies in the work environment of teachers in multigrade classes (e.g., follow-up support).

The research to identify the constraints in implementing educational innovations in multigrade schools of Benveniste and McEwan (2000) does mention two potentially important approaches that should be followed as a means of in-service support of rural multigrade teachers. The first approach is clustering, and the second approach is decentralisation, as illustrated in Table 2.4.

Table 2.4: Potential approaches as a means for in-service support of rural multigrade teachers (Adapted from Boonzaaier, 2008:123-124)

Clustering	Decentralisation
• Encourage schools to collaborate on a range of educational issues. • Share resources. • Share good teaching practice. • Share management techniques. • Build capacity in remote schools. • Reduce the feeling of teachers that they are isolated from innovation. • Support from central or regional government if they are to operate effectively, since there is a need for someone to take a leadership role in the cluster. • The financial commitment can be quite high initially.	• Encourage teachers and local education officials to participate in managing schools, developing learning materials and in making decisions regarding curriculum and pedagogical methods. • Foster independent learning and development of decision-making skills of teachers and local administrators. • Give them more freedom to tailor programmes to meet the needs of their communities. • Beneficial to strengthening the regional and district presence of the education administration.

Benveniste and McEwan (2000:43) do provide advantages and shortcomings of both approaches. The shortcomings of both approaches are that they do not provide the characteristics of the approaches or validated principles (the 'how to do' guidelines or heuristics) of an approach, do not clarify how the teachers should function if they are involved in a specific approach, or show the cause-and-effect relationships between the activities and outcomes for the teachers involved. They also do not indicate how clustering and decentralisation support the teacher as an individual in the classroom.

2.4 Support to multigrade teachers in South Africa

Despite the fact that multigrade education is not a new phenomenon in South Africa, and scholarly literature on education in South Africa during the past few decades has yielded significant evidence that the virtues of multigrade education have not been forgotten by educationists, it has not been possible for the Human Sciences Research Council (Ural, 1999:18) to compile a history of multigrade classroom practices in schools for historically disadvantaged sectors of the South African population. According to Vinjevold and Schindler (1997:132), the reason is that, in their own communication with South African provincial education departments, non-governmental education organisations and university education departments, until 1997 they could find no evidence of local projects or programmes dealing specifically with multigrade education.

A further reason for this absence of history and evidence of local projects or programmes, according to the Report of the Ministerial Committee on Rural Education (South Africa. Ministerial Committee on Rural Education, 2005), is the struggle the South African education system is faced with in order to deal with a segregated and authoritarian system brought about by apartheid and with national large-scale top-down curriculum reform, which is slow

and prescriptive. This centralised effort towards curriculum change, and the fact that the discrepancies between schools in terms of capacities, leadership, culture and relationships with the environment are so great, means that finding a blueprint for school improvement has resulted in overloaded and fragmented programmes.

The fact that no or little evidence dealing specifically with multigrade education could be found does not mean that the South African education system is not making provision for state support and interventions in rural schooling. The Report of the Ministerial Committee on Rural Education (South Africa. Ministerial Committee on Rural Education, 2005) cites considerable state support and interventions in rural schooling:

- Various recommendations, which include integrated, cross-sectorial approaches to rural education.
- Local provision and practices rooted in the community and supported departmentally and politically.
- Project-type support, which should be local, relevant, appropriate and with different permutations of constituent partners and role players.
- Support for cluster arrangements among schools.
- Since research-based evidence indicates that rural education is the single most neglected educational project in South Africa, an appropriate regulatory policy framework should be implemented, which will focus on rural education and farm schools in particular, as these are regarded as special cases warranting special attention (2005:12, 79).

The literature surveys on teaching trends in multigrade classes highlighted the following points:

- Multigrade classrooms can be very successful if teachers are correctly trained. Teachers need special preparation to cope with multigrade classes in isolated rural areas.
- Attitudes towards multigrade education are of paramount importance for success.
- Research indicates that multigrade classes as learning environments can be just as effective as monograde classes.
- Training for multigrade classes has been largely absent in the syllabus of teacher training in South Africa (Ural, 1999:15-16).

The lack of training for multigrade classes contributes to isolating multigrade teachers and

principals, and prevents their becoming skilled and competent within a multigrade context. The irony, according to Joubert (2006:3), is that while multigrade classes could be a solution to educating rural people in many African countries, governments tend to focus on improving conventional schools, often leaving the development of multigrade schools to local initiative.

Therefore professional development should focus on a process of support through which people and organisations move as they gradually learn, come to understand, become skilled and competent in the use of new ways, ensuring growth, improvement and support for the community and its members (Dana & Yendol-Hoppey, 2008:2-5).

According to Mouton (2003), the aim of the MGRSI was to produce a historical record of multigrade schooling, and to document and describe in some detail the key components and processes of the initiative, with the intention of developing a framework that could be used to document future cycles of implementation. The MGRSI can therefore be seen as a pioneer intervention in its creation of opportunities and support, through its provision of tools to multigrade teachers in South Africa.

In the Western Cape, as part of the WCED's contribution to the National Rural Upliftment plan, the MGRSI (Figure 2.2) was implemented in April 2002. The main intervention mode of the MGRSI consisted of in-service training and the key objective of the MGRSI was to develop multigrade education in rural schools through professional growth, resources and support to teachers in order to gain a measurable improvement in learners' performance in reading and mental maths, as well as a positive attitude among teachers towards lifelong learning (Mouton, 2003:3).

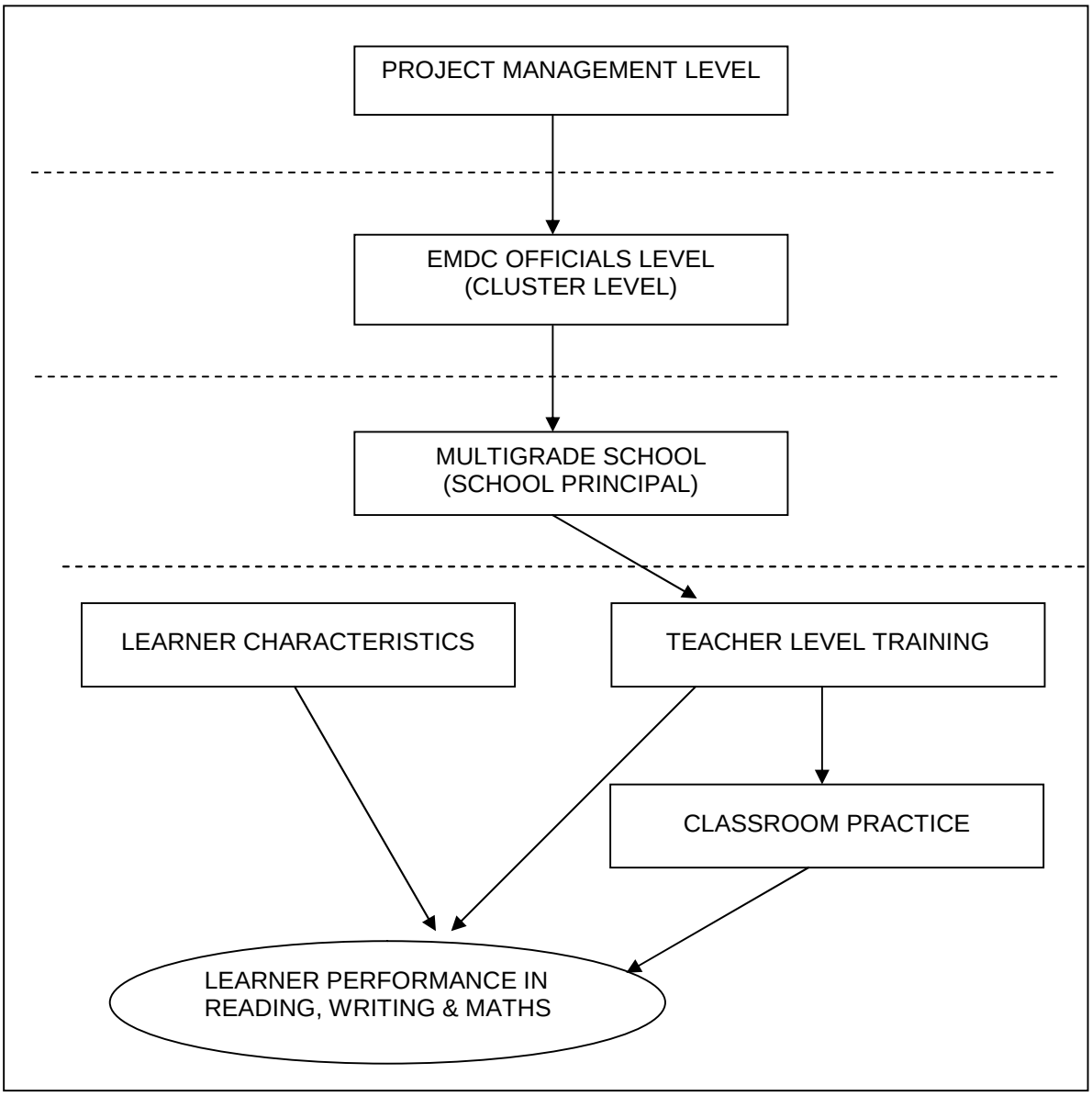


Figure 2.2: A diagrammatic representation of the Multigrade theoretical model of the MGRSI Programme (Mouton, 2003:36)

The main support component of the MGRSI for teachers in multigrade schools was situated in the cluster teams. The cluster teams consisted of officials at Educational Districts that received, as part of the MGRSI programme objectives, training to enable them to provide ongoing and appropriate support to multigrade schools and teachers (Mouton, 2003:16).

The relevance of the MGRSI for this research is that the intervention made the underlying programme theory (Table 2.5) or 'theory of change' of the intervention explicit, and explained why one does expect the outcomes to materialise as stipulated in the logic model framework.

Further relevance of this research is that it distinguishes between different levels of support systems in the multigrade intervention, and supplies the intended programme objectives, outcomes (Table 2.6) and actions for each level.

Table 2.5: Core programme theory of the Multigrade Rural School Initiative (Mouton, 2003:8)

The Multigrade Rural School Intervention
IF • Teachers are trained to efficiently manage and organise their multigrade classrooms. • Relevant learning programmes and resources are developed and made available to schools. • Teachers in these schools are trained to use, develop and apply such learning programmes optimally with the support of Information and Communication Technologies. • District level officials are trained to provide ongoing support to such teachers. THEN • The quality of teaching in multigrade schools will improve. • Learner participation and performance in reading, writing and mental mathematics will improve.

Table 2.6: Logic framework outcomes of the intervention (Mouton, 2003: iv-v)

LEVEL		**LEVEL OUTCOMES**
Project Management Level		• Progressive curricula for Grades R – 7 in reading, writing and mental maths which are available. • Demonstration schools that have been selected and demonstration lessons that have been developed. • Videos that have been developed and are used in pilot schools. • Appropriate standardised tests in reading, writing and mental maths which have been constructed and validated. • New software and electronic material to support multigrade schools which are available, and online support which is provided to districts and multigrade schools.
District Officials Level (Cluster Level)		• Officials at districts who are knowledgeable, informed and competent with regard to multigrade education. • Ongoing support by multi-functional teams. • Motivating feedback and support for teachers.
Multigrade School Level	School Principal outcomes	• School principals who have the required knowledge and skills to manage multigrade schools effectively.
	Teacher outcomes	• Effective online communication between teachers in a cluster occurs. • Teachers are able to do effective year planning for reading, writing and mental maths from Grades R – 7. • Teachers are skilled in time and lesson programme planning. • Teachers are able to implement learning programmes for reading, writing and mental maths from Grades 1 to 6 effectively. • Teachers have adequate knowledge of child development and learning during planning and presentation. • Teachers have adequate teaching and management skills. • Teachers are skilled in group formation and design of co-operative group tasks. • Teachers are able to use a range of appropriate teaching and learning strategies effectively. • Teachers have sufficient knowledge and skills to conduct the assessment, evaluation and reporting of learner progress.

According to the case study of Boonzaaier (2008:296) that revealed the successes and the challenges of the MGRSI implemented from 2001 to 2006, although the officials from the support level structure of the MGRSI agreed that classroom management techniques, instructional strategies, and planned and instructional materials were foci of the MGRSI training strategy, they admitted that some of them, as identified in the weaknesses (Table

2.7) of the MGRSI, did not have any understanding of what the training was about. Boonzaaier (2008:297) argues that this is an indication that the support staff did not yet feel fully equipped to support multigrade schools with regard to the mentioned foci.

Table 2.7: Strengths and weaknesses of the MGRSI (Adapted from Mouton, 2003:32; Boonzaaier, 2008:343)

The strengths of the MGRSI	The weaknesses of the MGRSI
• The partial involvement of district managers. • Involvement of Higher Education Institutions. • The well-structured composition of the MGRSI programme. • The set objectives. • The exposure to international experience. • The baseline assessments done. • Improvement of teaching strategies. • Communication in cluster context. • Knowledge of e-Learning. • Utilisation of lead teachers. • The demonstration strategy. • The focus on the organisation of classrooms.	• The lack of sustainability. • The lack of commitment by schools. • Gaps identified with regard to the training strategy, which included the lack of focus on all the learning areas and the full National Curriculum Statement. • Insufficient time afforded to training District officials. • Proper training of the Multi- Functional Teams. • The lack of electronic connectivity. • The lack of a structured follow-up strategy. • The lack of cohesiveness in the support activities at district level.

The observation by Boonzaaier (2008:299) also indicates that although the support systems should have strengthened and nourished the newly attained knowledge and skills of the teachers by means of continuous support strategies, the lack of frequent visits hampered the quality of the follow-up support. Although the knowledge and competence of the officials who visited the schools were highly valued, the teachers' input also confirmed that they experienced the amount of support, provided by various officials, differently; for example, the foundation phase respondents found the support more encouraging than other respondents did.

A local initiative, a comprehensive baseline study (Centre for Multigrade Education, 2009:11) by the Centre for Multigrade Education situated in Wellington, South Africa, and conducted in the nine provinces of South Africa (Limpopo, Mpumalanga, North-West, Gauteng, Free State, KwaZulu-Natal, Eastern Cape, Northern Cape, and Western Cape), with the aim (Table 2.8) of collecting all relevant information from which the real circumstances of multigrade schooling in the classrooms could be obtained, identified that the problem of supporting multigrade teachers in South Africa was substantial and daunting, and that a solution to the problem would lead to significant advances in learning (or at least a significant reduction in malfunction within the multigrade educational system).

Table 2.8: Aims of baseline study conducted in the nine provinces of South Africa (Centre for Multigrade Education, 2009:11)

Aims
• To conduct a situation analysis of multigrade education in South Africa in order to collect all relevant information on multigrade education in the nine provinces of South Africa. • To compare the perceptions of the concept 'multigrade' among schools and officials to draw up case studies from which the real circumstances of multigrade education in the classrooms could be obtained. • To write a definition for South Africa about what multigrade education is all about.

The relevance of the baseline study (Centre for Multigrade Education, 2009) for this research is that it did not just expose the lack of support and support systems in South Africa, but also exposed the extent of the problem and the specific needs (Table 2.9) of the role-players at each level of multigrade education in South Africa. It is also the first and only study conducted in South Africa to analyse multigrade education in all nine provinces.

Multigrade education in South Africa shows a resemblance to the chain of problems experienced internationally. Most teachers involved in the above baseline study in South Arica had not received official training in multigrade education and experienced a lack of training and support. It is evident from the baseline study that, owing to the extent of the problem experienced at each level of multigrade education in the education system in South Africa, chances are slight that support to teachers will come from officials and curriculum advisers.

Table 2.9: Findings of the baseline study conducted in the nine provinces of South Africa (Centre for Multigrade Education, 2009:26, 44, 46-47, 52)

LEVEL	The baseline study identified the following:
Officials	• The officials indicated that they intended to resuscitate the Rural Education Development in their province. Critical issues relating to multigrade were not addressed adequately. • The officials admitted that the needs of multigrade schools and teachers were not serviced adequately, as the multigrade schools were located in remote rural environments. • The officials indicated that they were willing to develop intervention strategies and do the monitoring and support of multigrade education. They acknowledged that they were not fully equipped for the task, but saw it as a developmental opportunity to improve their guidance to these schools. • The officials agreed that the curriculum advisors were not fully equipped to advise teachers in multigrade schools, as they had not been trained for that purpose. • The officials indicated that no official training was conducted for officials in multigrade education in most of the provinces, and that no research on the topic of which they were aware had been done in their provinces.
Curriculum advisers	• It was important that the curriculum advisors needed to understand the environment (circumstances) of multigrade schools. • The curriculum advisors found it difficult to support and advise multigrade teachers. • They only supported and advised in their specific learning areas when visiting a school.

LEVEL	The baseline study identified the following:
Principals	• The principals experienced that teachers were neither positive nor confident with regard to multigrade education. • The principals indicated that no official training was conducted for principals or teachers in multigrade education in most of the provinces, and that no research on the topic of which they were aware had been done in their provinces. • The principals of these schools should also be trained to manage this challenge. • The principals and teachers agreed that they had also experienced very little support from the Department of Education. • It was a huge frustration for principals that officials were not able to help and support the multigrade teachers. It was felt that subject advisors confused (rather than helped) teachers in the multigrade situation.
Teachers	• Although teachers did recognise the advantages of working together, network clustering was experienced as problematic for multigrade teachers because they met as cluster groups but were uncertain about how they could support one another. • Although training was promised, teachers still experienced a lack of training and support with regard to multigrade education. • Most of the teacher respondents also indicated that they had not received official training in multigrade education. Their only training was their own experience, which stretched over a couple of years.

2.5 Conclusion

This chapter discussed the current needs, situation, problems and challenges in supporting teachers in multigrade classrooms. From the above analysis, it is clear that:

- in most countries teacher education for multigrade education does not exist at all;
- some countries offer it as part of in-service training; and
- no how-to-do guidelines for multigrade education exist.

The problem of multigrade teacher support is therefore substantial and daunting, and a solution to the problem should lead to significant advances in learning, or at least a significant reduction in malfunction in the multigrade educational system.

The purpose of this research is to identify the problems and to see how the current situation in multigrade education in South Africa may be improved by providing multigrade teachers and principals with properly supported opportunities to interact and work together.

In addressing the first research sub-question, "What are the current needs, problems and challenges that multigrade teachers and principals face in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting?" it is evident that this research should build on the following aspects:

- An approach that supports and guides the interaction and collaboration of teachers in a cluster.
- Teachers as active participants involved in their own learning and understanding, within the complexity and context of their actual classroom situation, and according to the needs they want to address.

CHAPTER 3

LITERATURE REVIEW: A CONCEPTUAL FRAMEWORK FOR PROFESSIONAL LEARNING COMMUNITIES

This chapter provides information on the concept 'professional learning community' and elaborates on the characteristics of a professional learning community. Such a community provides its members with opportunities to interact with and support one another in moving their organisation in the desired direction, guided by established and clear benchmarks of progress and accomplished milestones. Finally, the conceptual framework for this research is introduced.

3.1 Professional learning community

> Twenty-first century learning communities are not factories built on assembly-line principles: They are places where shared goals are met by individuals and teams working together to capitalize on the talents and strengths of every member of that community (McTighe & Brown, 2005:243).

A PLC is not a new concept, but more and more organisations in the education profession in various countries are currently underwriting this concept (e.g., The National Commission on Teaching and America's Future; The National Board for Professional Teaching Standards; The National Council of Teachers of Mathematics; The National Science Teachers Association; The Southwest Educational Development Laboratory; American Federation of Teachers; The National Middle School Association; The National Association of Elementary School Principals; The National Association of Secondary School Principals; The North Central Association Commission on Accreditation and School Improvement). This is due to the abundant research supporting PLCs, and the fact that organisations, created for the specific purpose of making the education profession more rewarding, satisfying and effective, have almost universally endorsed the PLC concept as a key strategy for accomplishing their objectives (DuFour, DuFour & Eaker, 2008:72-78).

The idea of a PLC has its origin in the business sector, with the conviction that organisations can learn (Feger & Arruda, 2008:3). Senge (1990:3-5), examining the work of Argyris (1993), identified in *The Fifth Discipline*, the five factors that individuals and their organisations collectively need in order to become a learning organisation. To become a learning organisation, according to Senge, individuals and organisations must focus on:

- system thinking: the ability of the members of an organisation to see the bigger picture and to function as a whole system;

- building a shared vision: a vision owned and developed by all levels in an organisation, creating a focus and energy for learning in the organisation;
- personal mastery: the commitment of each individual to the process of learning to become the best at one's vocation;
- the use of mental models: mental images that influence how we understand the world and guide people's actions; and
- team learning: sharing individual learning with others, and enhancing team knowledge in a way that promotes the performance of the organisation.

The focus of a learning organisation shifted from the business sector to education with the findings of Rosenholtz (1989) that the teachers who received support for their own continual learning and in their classroom practice, were more dedicated and effective. McLaughlin and Talbert (1993) verified Rosenholtz's findings and furthermore suggested that experienced teachers be given the opportunity to investigate and learn together, in order to build a source of wisdom and knowledge. Stenhouse (1975) and Schön (1983) supported the role and place of teachers as researchers and reflective practitioners in the classroom and at school.

The concept of PLCs has emerged from a variety of sources and is connected with notions of enquiry, reflection and with self-evaluating schools. From the school-based curriculum development movement of the 1970s the 'thinking school', 'problem-solving school' and 'creative school' emerged. In the 1980s it shifted to 'self-reviewing' or 'self evaluating school' (Stoll, Bolam, McMahon, Wallace & Thomas, 2006).

As schools began to implement this model of learning organisations in the late 1990s in the USA, the concept 'learning organisations' was replaced with the concept 'professional learning community' (Thompson *et al.*, 2004:2; Bolam *et al*., 2005:6). Several declarations in sources justify the concept of a professional learning community:

- Hord (1997) argues that the concept of a PLC originated from people working together in a profession and at a school.
- Louis, Kruse and Associates (1995:4) use the concept to describe a more supportive and attractive working environment, which helps teachers to concentrate and improve their abilities.
- Seashore, Anderson and Riedel (2003:3) use the concept to describe the establishment of a school culture, with expected, continual, inclusive, sincere and focused co-operation.

- DuFour and Eaker (1998:xi-xii) view the concept as teachers, working together to attain what they cannot attain on their own; thus an environment is created which cherishes communal co-operation, emotional support, personal growth and learning.

The basis of the concept 'professional learning community' rests with the point of departure that learners' learning is enhanced when there is an improvement in the classroom practice and pedagogy of the teachers – what teachers need to know and the skills they need to command in order to make and justify the many different kinds of decisions of which teaching is constituted (Alexander, 2004:11; Vescio *et al.*, 2008: 82). To achieve this, teachers need to work together, thereby creating an environment, which cherishes communal co-operation, emotional support, personal growth and learning.

Therefore, existing PLC literature and research agree and confirm that a PLC must not be seen as just another meeting in which a group of teachers participates, but as a manner of functioning which occurs and is directed by the ideas that unite people and give them a sense of direction in their day-to-day work, as iterated by Hord, Roussin and Sommers (2010:1):

- To determine whether learning takes place by all learners there must be a definite yearning by all teachers to find proof of this and to ensure that all learners learn.
- The fundamental aim can only be attained if teachers don't work and function in isolation.
- Change requires learning and learning motivates change.

In studies conducted in The Netherlands (Geijsel, Van den Berg & Sleegers, 1999) researchers compared schools that more readily adopted innovations with schools that did not readily adopt innovations. They found that in schools that adopted innovations more readily, the following elements were present:

- Teachers knew and shared the leader's vision.
- A leader in the school had taken responsibility for facilitating joint goals and promoting a culture of collaboration among teachers.
- The leader evinced dedication.
- Respect for and understanding of the personal feelings of the teachers were communicated.
- Collaboration at a higher level was fostered.

- Teacher participation in decision-making through team meetings was facilitated and supported.
- There was a mutual desire for personal growth as well as continued schooling and training.

For this research the review of literature focused on publications that included data about the impact of a school-based PLC on teaching practices in order to address one of the major challenges of multigrade education and professional development for teachers teaching in multigrade schools – the failure of what needs to be done (knowledge) to result in action or behaviour that is consistent with that knowledge in multigrade schools.

Although the literature did not offer many examples of specific changes in pedagogy [the observable act of teaching together with what one needs to know and the skills one needs to command (Alexander, 2008:29)], it did offer examples of change in the professional culture of schools that had implemented a PLC:

- In an overview of existing research, on the impact of a PLC on teaching practices, Vescio *et al.* (2008:83) found that "analysis supported the idea that participation in a learning community leads to changes in teaching practice".
- In a two-year study for the Annenberg Institute for School Reform (2003) on critical friends' groups, Dunne, Nave and Lewis (2000) found that the participants began using more student-centred practices over time and included more flexible classroom arrangements to meet an individual student's needs.
- Louis and Marks (1998), examining the connection between the quality of classroom pedagogy and the existence of the core characteristics of a PLC, found that the presence of a PLC in a school contributed to a higher level of social support for achievement and higher levels of authentic pedagogy.
- Andrews and Lewis (2002) indicated that teachers who participated in a learning community reported changes in their practices.
- A learning community structure in a rural elementary school helped teachers, through collaborative structures, to examine their practice (Berry, Johnson & Montgomery, 2005).
- In an extensive restructuring study by the Centre on Organization and Restructuring of Schools (Newmann & Wehlage, 1995), findings showed that in schools that were characterised by professional learning communities, the teachers had worked together and changed their classroom pedagogy.

The reviewed literature showed that the PLC model was working to shift teachers' habits of mind. It created a culture of teaching that encouraged teachers to enhance teacher learning, thereby allowing them to change their teaching practice and classroom pedagogy. A shortcoming of the above-mentioned scholarly literature was that in many of the studies the researchers, in only reporting on how the teachers perceived their practices, failed to provide specific information about the nature of changes in practice or pedagogy (Vescio *et al.*, 2008:84, 89).

What was revealed in the literature review is that the presence of a PLC in a school contributed to changes in teaching practices and classroom pedagogy; achieved a higher level of social support for achievement and higher levels of authentic pedagogy; and provided a major challenge in terms of multigrade education and professional development for teachers in multigrade schools. Multigrade teachers find the implementation of an educational innovation difficult because they must change the core of educational practice – a pedagogy the multigrade teachers do not know or in which they did not receive any training or support. This is because they must implement pedagogy (monograde) that is not authentic to their unique context within a multigrade classroom.

There is no universal definition for a PLC and educational literature provides different definitions and characteristics of a PLC (Feger & Arruda, 2008:3). For the purpose of this research, the declaration of a PLC of Hord (1997) will be used for a concept declaration of a PLC in the context of multigrade education for multigrade teachers committed towards working together in a cluster in South Africa:

> *"* ... [A professional learning community may be defined as the] collective learning among staff and the application of the learning to solutions that address students' learning ... [and the] ... physical conditions and human capacities that support such an operation*"* (Hord, 1997:24).

Hord is seen as one of the most authoritative experts in the area of professional learning communities and her research also provides an overview of a working model in practice. It is also the research most cited and used by other researchers on this topic. For this research, the wording of the definition of Hord will be adapted to:

- address the specific context and needs of multigrade education in South Africa;
- act as a working definition for this specific research; and
- act as a specific working definition for the teachers involved in this research.

For this research, the researcher will use the following working definition in the context of multigrade education:

A PLC is a collaboration of multigrade teachers in South Africa committed towards working together in a cluster as active participants, to support one another in the complexity of multigrade education and the needs they want to address.

In order to understand the concept 'professional learning community', the different words that constitute the concept 'professional learning community' must first be 'unpacked' by investigating and clarifying the meaning of each word:

Professional

Bolam *et al.* (2005:vi) contend that the concept 'professional' does not only refer to teachers who have been trained professionally or who are currently in a profession, but to all role-players who have interests in the institution or school. Marzano (InPraxis Group Inc., 2006:3) views the term 'professional' as the manner in which the staff in a school work together and the way in which they approach their work. Jackson and Tasker (2003:3) define 'professional' as the creation of a professional environment – one that adds value to continual learning and the building of a professional knowledge basis of education. The distinctive professional knowledge basis of education is pedagogics (Jackson & Tasker, 2003:3). The arguments of both Marzano, and Jackson and Tasker, are important for this research because they emphasise the importance of all role-players in a professional environment. They focus on professional action and learning of all role-players, and the continual building of a professional knowledge base of education, to ensure the productivity of the learning community.

Learning

In a PLC, learning directs the constant search for opportunities to mutually (as role-players) investigate existing traditional practices and to improve them, and to contribute to the corpus of knowledge as a whole (Feger & Arruda, 2008:8). Plomp (2009:10, 20) argues that the main aim of scientific research in the domain of education is the search for and generation of knowledge and concepts, the how and why something takes place in a given context, with the aim of making a contribution to the body of knowledge. The concept of learning in a PLC thus emphasises the generation of professional knowledge in terms of change, rather than being task-driven (Owen, 2004:6). Wenger (1998) refers to this kind of knowledge as knowledge generated in practice ('owned in practice'). Dana and Yendol-Hoppey (2008:2-3) support Wenger's argument, but distinguish between knowledge *for* practice, knowledge *in* practice and knowledge *of* practice (Figure 3.1).

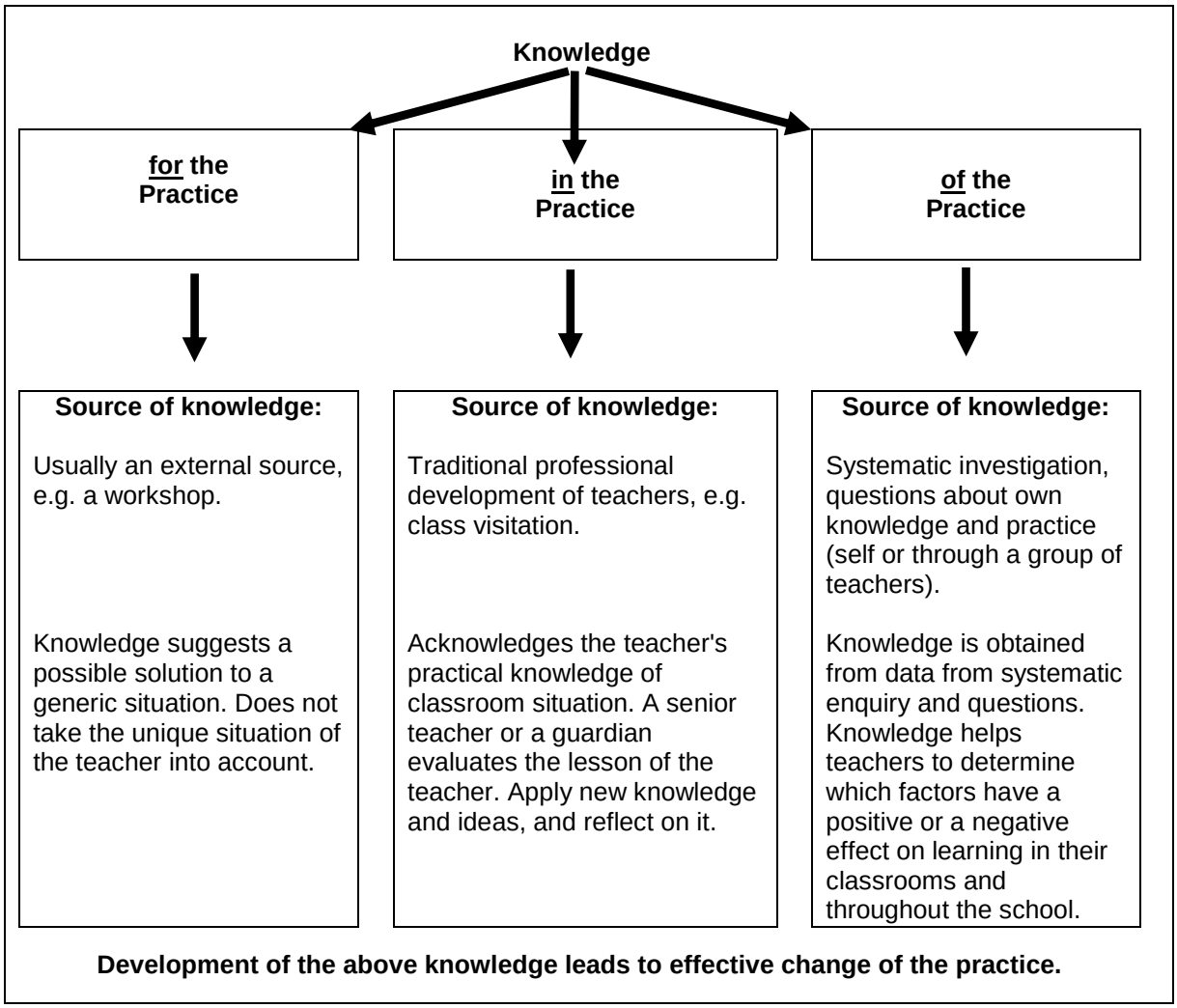


Figure 3.1: Knowledge (Dana & Yendol-Hoppey, 2008:2-5)

Community

The moral resolution and intentions and the shared values of the members circumscribe the concept 'community' in a PLC. Because of a determined mission, vision and shared values, members have much in common and form a community – one with common beliefs, respect and support. Joint responsibility and co-operation are some of the characteristics, which are highly thought of (Bolam *et al*., 2005:vi). DuFour and Eaker (1998:25-29) also identify six characteristics which help to unpack the concept of community: shared understanding and common values; striving towards common research; co-operation as a team with a common goal; an undertaking towards action and experiments; an alliance to strive towards continual improvement; and willingness to be assessed with regard to results.

3.2 The place of a professional learning community in theories and philosophies, which focus on the social and situational nature of learning

The challenge remains how to provide high-quality professional support to teachers that will have an impact on their pedagogical knowledge in a multigrade classroom. The literature supporting a PLC as an effective means of a support approach to teachers working together is built on a strong foundation of educational research, theory and philosophy.

In this section, educational theory and philosophy supporting a PLC will be discussed. The first is Knowles (1975:15) whose learning theory (andragogy) for adults focuses on the development of the ability of adults to increasingly take responsibility for their own lives and learning. Second is the theory of the social nature of learning and the exposition of the circumstances in which teachers share and build their work, as expounded by Lave and Wenger (1991) and Tennant (1997:77). Third is Vygotsky's (1978) zone of proximal development (ZPD) that focuses on identifying the developmental level and the ZPD of the teacher. Fourth is the theory of mental models of Argyris and Schön (1974; 1978) that focuses on changing our underlying mental models and decision rules to better serve us within the complexity of the real world.

3.2.1 Knowles's learning theory for adults

Learning and living are closely entwined. Therefore life-long learning is directed at a search for a better and higher quality of life. But the quality of life largely depends on the quality of learning, which a person has received and acquired (Dave, 1975:43).

Learning is defined as: "The process of gaining knowledge, skills, or understanding through study, instruction, or experience" (Ravitch, 2007:131).

Unfortunately this concept is not as simple as Ravitch's definition (2007); therefore teachers and education officials must keep abreast of the latest developments and studies with regard to how people learn.

If education systems want to create an environment which enhances learning, the focus must be on learning and how learning takes place; thus moving away from learning as simply the transfer of existing and known information, to a process. This is a process that supports teachers in integrating their own individual learning styles, subject content knowledge and strategies to build up knowledge, to change it and to create their own meaning to use for learning (Werkgroep BZL – Pedagogische Begeleidingsdienst Gemeenschapsonderwijs, 2006:9).

The problem with most workshops, as the most prominent model of the development of multigrade teachers, is that they focus on a behaviouristic orientation to learning where the focus of learning is situated in an external environment, developed by an external source; the learning process also focuses on change in behaviour. It is expected of the teachers to be organised in order to elicit the correct behaviour regarding the pre-packaged product. With the application of a behaviouristic orientation to learning, this model ignores the change of focus of learning over time (Table 3.1) – from behaviourism to a social orientation to learning (Merriam & Caffarella, 1991:138).

Table 3.1: Change of focus of learning over time (Merriam & Caffarella, 1991:138)

	LEARNING THEORY →			
	Behaviourism	**Cognitivism**	**Humanism**	**Social**
Aim of the learning process	Change of behaviour.	Internal intellectual process (including insight, information, processing, memory, perception).	Personal action to attain potential.	Interaction/ observation in a social context.
Aim in education	Produces behavioural change in desired direction.	Development of competence and skills in order to learn better.	Self-realisation and self-directed learning.	Full participation in community and utilisation of sources.

Knowles's learning theory for adults, which states that one of the most important aspects of maturity is the development of the ability to increasingly take responsibility for one's own life, focuses on the process to help adults to become increasingly self-centred (Knowles, 1975:15). Knowles (1990) identifies six characteristics of adult learners:

- Adults bring considerable experience to the learning environment.
- Adults desire a high degree of influence on what they will learn and how they will learn it.
- Adults should be encouraged to participate in designing and implementing a learning programme.
- Adults want to see the applications of the new learning.
- Adults wish to have considerable influence on how learning will be assessed.
- Adults expect, when they are asked for feedback on their learning progress, their responses to be acted upon.

By focusing on a humanistic perspective, grounded in Knowles's learning theory for adults, a PLC shifts the focus of the learning process from a change in behaviour to a personal action to attain potential through self-realisation and self-directed learning. Such a personal action is grounded in a process in which individuals take the initiative, with or without the help of others, in diagnosing their needs, formulating goals, identifying human and material resources, choosing and implementing appropriate strategies and evaluating the outcomes (Knowles, 1975:18). To achieve this, teachers must be involved in a learning process of interaction and observation within a social context.

The significance of Knowles's learning theory for adults, which is based on a humanistic perspective of learning, for this research, is that it addresses one of the challenges of multigrade education and professional development for teachers in multigrade schools.

Existing training for multigrade teachers often turns participants into passive recipients of information without a 'deep learning' and understanding of the real strategy, practice or change.

3.2.2 Social nature of learning and the exposition of the circumstances in which teachers share and build their work

Literature about the learning process in a PLC is also based on theories and philosophies which focus on the social nature of learning and the exposition of the circumstances in which teachers share and build their work (Feger & Arruda, 2008:5). The learning process in a PLC, focusing on the social nature of learning and the exposition of the circumstances in which teachers share and build their work, is grounded in the theories expounded below:

- Dewey's philosophy that we learn from experience and reflection on our experience (Beattie, 2000:2).
- Vygotsky's argument that learning must take place in a social context and must rely on communication, co-operation and support (zone of proximal development) with others in order to fully develop (Darling-Hammond, Barron, Pearson, Schoenfeld, Stage, Zimmerman, Cervetti & Tilson, 2008:91; 197).
- Piaget's observation that learning takes place because of adaptation to interactions with the environment (Resta, 2002:26). His constructivistic learning theory has the viewpoint that individuals create comprehension and knowledge from their own experiences. Connecting these with prior knowledge helps the individual to make sense of the new information.

- The experience theory (experiential learning), which defines learning as the process through which knowledge is created by the transformation of experience from expertise (Kolb, 1984:41). Experimental learning focuses on learning where there is the opportunity to acquire knowledge, skills and feelings, and to experience these and apply them in an immediate and relevant environment (Brookfield, 1983:16). The official responsibility for learning is not vested in a formal educational institution, but with the person himself (Kolb & Fry, 1975).
- Mediated learning defines learning as the interaction of people with their environment by means of a human mediator. The mediator focuses on the approach of the people to solve the problem and the thought processes of the people (Presseisen & Kozulin, 1992).
- Reflective learning defines learning as the reflection of our own experiences, feelings and theories to build new understanding and knowledge to perform actions in the disclosed situation (Schön, 1983).
- Situated learning, which defines learning as the social and cultural construction of knowledge and understanding during the process of co-operation to address real problems in context (Resta, 2002:28).

With the emphasis on participation in a learning community within the context and reality of everyday practice, the learning process in a PLC is well founded in the social and situational learning model (Figure 3.2) (Owen, 2004:5-10); that is, within a PLC where the members, as active agents of innovation, work together in the process of generating learning and creating information and knowledge (Nonaka & Takeuchi, 1995:12).

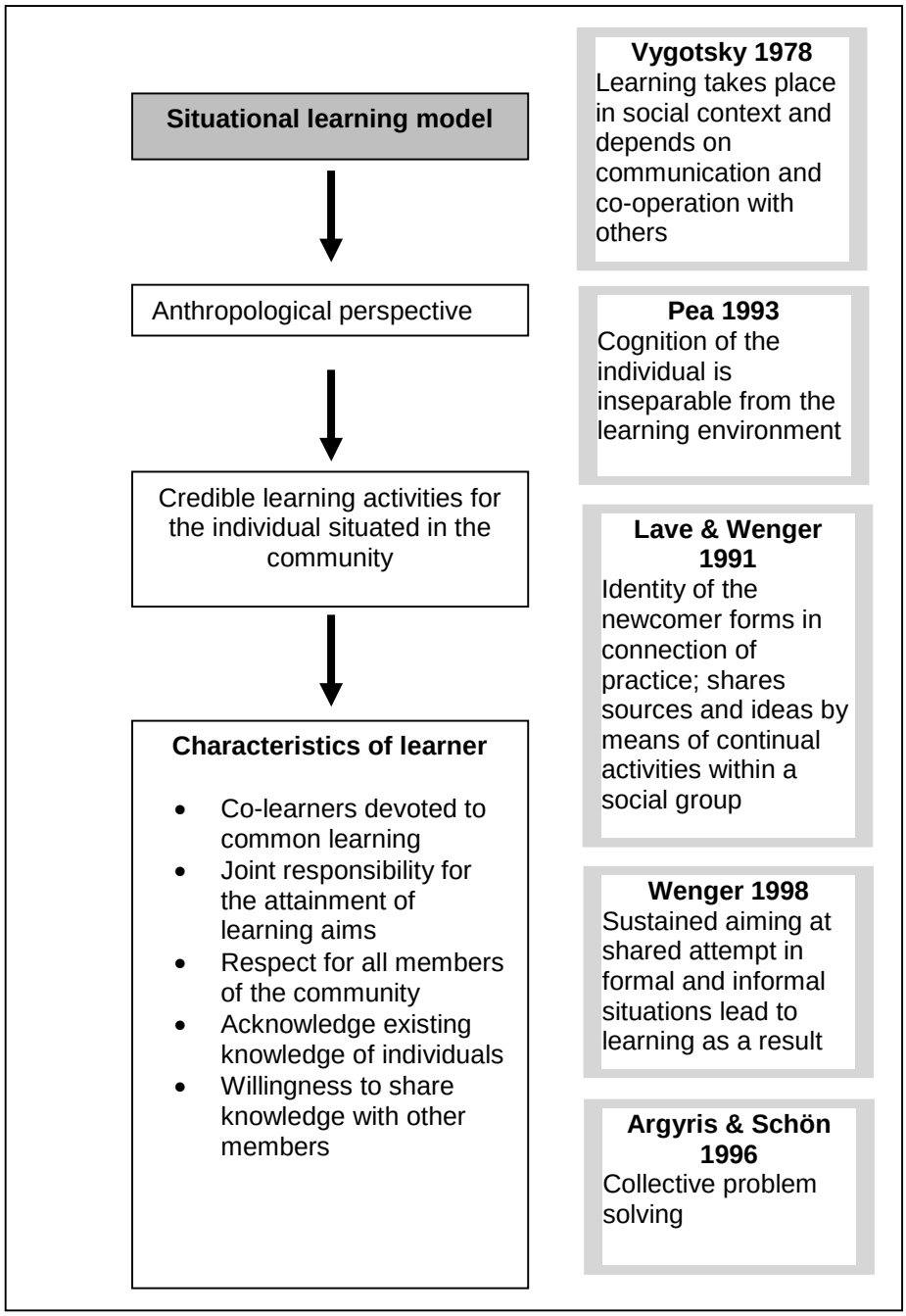


Figure 3.2: Situational learning model (Owen, 2004:5-10)

Lave and Wenger (1991) have, with their situational learning model, shifted the learning process to a social alliance in the creation of a suitable context for learning – a social alliance which entertains situational learning, that is:

- to place the reasoning capacity in a specific place;
- to involve all members of society, as well as the environment and activities, in order to create meaning; and

- to determine the process of thoughts and doings of experts in the realisation of knowledge and skills in a specific area (Stein, 1998:2).

Tennant (1997:77) argues that situational learning depends on two claims:

- Talking about knowledge which is outside context, or which is abstract or general, has little value.
- The formation and notion of new knowledge and learning are situated in a community of practice.

A PLC, with its emphasis on participation in a learning community within the context and reality of everyday practice, places the teacher in the middle of the learning process (a learning process which integrates content, context, community and participation) by means of the following:

- The content, which cannot simply be viewed as the absorption of facts, but rather as the accentuation of higher order and reflective thought processes within the context of teachers' daily practice.
- A context which makes provision for an environment where shared experiences from within different perspectives may be investigated, and where learning formed and shared by the community and by participation as members of a community, give teachers the opportunity to assign meaning to their experience (Stein, 1998:2-3).

The significance of a PLC, well-founded in the social and situational learning model, for this research, is that it addresses a challenge, that is, that knowledge obtained at a workshop suggests a potential solution for generic learning dilemmas, without helping and supporting teachers to understand and address these dilemmas that emerge as they implement the new practices within their classrooms. It also provides the characteristics of a learner involved in the social and situational learning model. (See the characteristics of a learner in Figure 3.2.)

In practice this means moving from a traditional model, where teachers used to function as isolated practitioners, to a co-operative and learning-centred model. A paradigm shift (Table 3.2) must thus take place with teachers to ensure that learning is well grounded in practice through social interaction and co-operation (see teachers who cooperate in Table 3.2) with the activities, context and culture in which they take place (InPraxis Group Inc., 2006:9-10).

Table 3.2: Paradigm move to a Professional Learning Community (InPraxis Group Inc., 2006:9-10)

Isolated teachers ...	Teachers who co-operate ...
... are isolated in their classrooms and don't cooperate with other teachers to develop strategies and learning in learners.	... work with other teachers to address problems which focus on learning in learners; ... feel jointly responsible for the growth and learning of all teachers and learners in the school; ... understand that teachers do not have all the answers, but that all teachers have the knowledge to make a contribution.
... educate according to determined curricular standards which remain static over time.	... jointly focus on the creation of new knowledge and view their own learning and that of learners as a life-long process.
... spend little or no time to work with other teachers.	... have predetermined times to observe the work of other teachers and to reflect on it.
... are measured in isolation according to external professional standards.	... agree on predetermined standards, which ensure shared responsibility for the growth of learning in teachers and learners.
... identify their own education standards and style.	... develop comprehension for the education styles and techniques of all teachers so that they can learn from each other.
... usually fail, because of an absence of shared aims, norms and comprehension, to build professional relationships, communication and trust with other teachers, learners and parents.	... also rate regular communication, based on trust, shared aims and professional norms, very high.

3.2.3 Developmental level and the zone of proximal development (ZPD)

According to Sweeny (2010:3), if teachers' needs are not addressed at the stage they are at or at the level they are experiencing difficulty, they become stuck at some lower level or will use or adopt coping strategies which are often poor practice; this subsequently leads to a disconnection between knowledge and action on teacher-learning and use.

The research team of the Research and Development Center for Teacher Education (R&DCTE) at the University of Texas, in exploring over the last 35 years the issues involved in the implementation of new programmes and practices, found it necessary during their research to study the support for teachers in the implementation and change process at schools and universities (Hord *et al*., 2006:xi).

The CBAM (Figure 3.3), which evolved from the research of the R&DCTE in the 1970s during a long-term study from 1970 to 1986, is designed to support research into implementation of an educational innovation and focuses in particular on supporting teachers. Serving as a framework, the CBAM helps facilitators to identify the special needs of individuals involved in the implementation and change process, and to support and address those needs, appropriately based on information gathered through the model's diagnostic dimensions:

- Stages of Concern (SoC) – How teachers perceive an innovation and how they feel about it.
- Levels of Use (LoU) – Identify what a teacher is doing or not doing in relation to the innovation.
- Innovation Configurations (IC/IC Maps) – Focus on describing the operational forms an innovation can take (Hord *et al*., 2006:2).

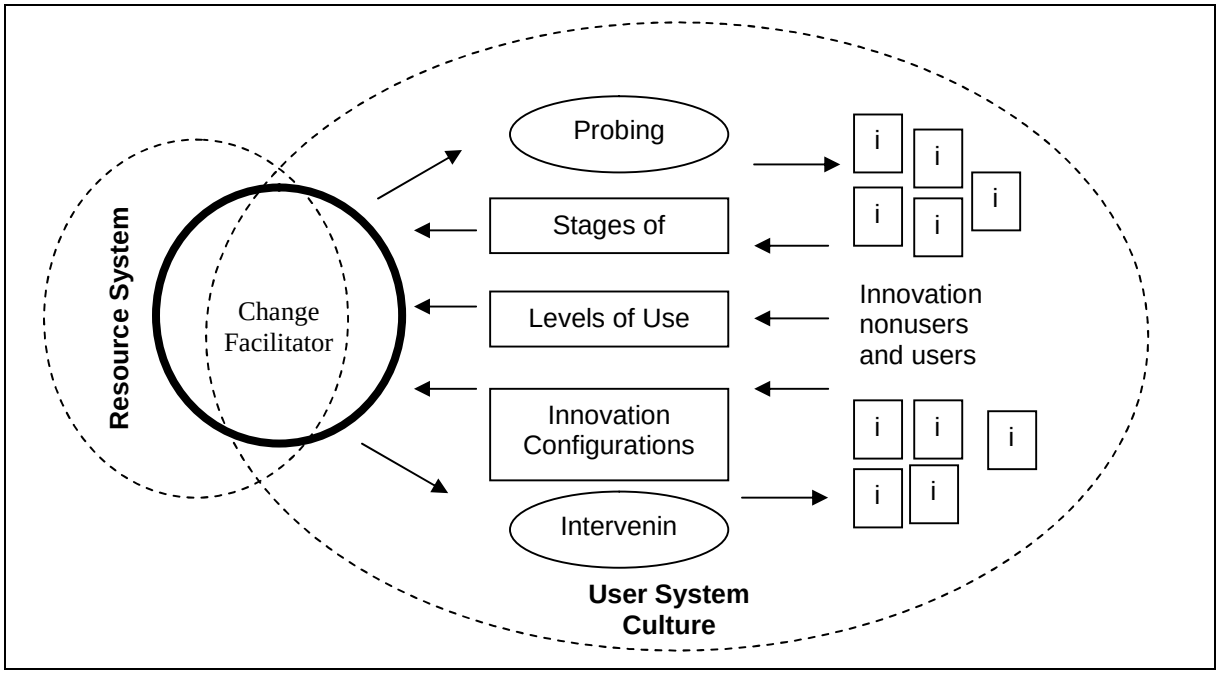


Figure 3.3: The Concerns-Based Adoption Model (Hall *et al*., 2006:2)

In investigating what happened when individuals were asked to change their practices or adopt an innovation, the researchers identified seven SoC (focusing on the feelings of the individual) and eight LoU (focusing on the performance of the individual), and through which an individual progressed as he/she implemented an innovation and become in its use (Table 3.3).

Table 3.3: CBAM: Stages of Concern, defines human learning and development as going through 7 stages (Adapted from Hall et al., 2006:5-7)

FEELINGS (SoC)						
1	**2**	**3**	**4**	**5**	**6**	**7**
I am concerned about some other things.	I would like to know more about it.	How will using it affect me?	I seem to be spending all of my time getting materials ready.	How is my use affecting clients?	I am concerned about relating what I am doing with what my co-workers are doing.	I have some ideas about something that would work better.
Unconcerned	Informational	Personal	Management	Con-sequence	Collaboration	Refocusing
KNOWLEDGE & ACTION						
Unrelated	Self		Task	Impact on learners and in classroom		
Level of use: observable behaviour (LoU)						
Non-use	Orientation	Preparation	Mechanical use & Routine	Refinement	Integration	Renewal
User's development in acquiring new skills and varying use of the innovation						
State in which the user has little or no knowledge of the innovation, has no involvement with the innovation, and is doing nothing about becoming involved.	State in which the user has acquired or is acquiring information about the innovation and/or has explored its value orientation and its demands upon the user and the user/system.	State in which the user is preparing for the first use of the innovation.	State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than clients' needs.	State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence.	State in which the user is combining own efforts to use the innovation with the related activities of colleagues to achieve a collective effect on clients within their common sphere of influence.	State in which the user re-evaluates the quality of the use of the innovation, seeks major modifications or alternatives to present innovation to achieve increased impact on clients.

Vygotsky (1978:86) refers to this process of experiencing difficulty as mental functions that have not yet matured. He argues that in order to understand the teachers' mental development, it is essential to identify the developmental level and the ZPD of the teachers. The ZPD is the distance between the actual developmental level of the teacher (all the functions and activities teachers can perform on their own without help from somebody else), and the level of potential development (all functions and activities teachers can perform only with guidance from and the assistance of someone else). According to Vygotsky and Luria (1993), the learners (in this case, teachers), must first engage in concrete activities that support the formation of mental models before forming abstract conceptualisations.

The significance of Vygotsky's (1978) idea of social constructivism and sociocultural theory of learning for this research is that:

- it supports the concept of community of enquiry and practice;
- the ZPD represents the crystallisation of the internalisation process and describes the most fertile interactions that occur between teachers and more able members of society;
- human intelligence originates in society or culture; and
- cognitive gain occurs first through interpersonal interactions and then intrapersonal enquiries.

The significance of a PLC, well founded in the idea of social constructivism, for this research, is that it supports the concept of a community of enquiry and practice. In practice this means that if teachers' needs are to be addressed, in terms of developmental gains within the teachers, they must be involved in interactions between themselves and more able members of their culture, addressing the ZPD of each teacher.

3.2.4 Argyris and Schön, theory of mental models

> In order for school staff to appreciate and value the changes needed for improving teaching and learning, not only must there be clear reasons for making the changes but also staff must be given a road map of sorts. To value the change, teachers must first learn all they need to know about the change (Morrissey, 2000:23-24).

Argyris and Schön (1974) argue that people have mental maps (models) with regard to how to act in situations and that these models affect the way they plan, implement and review their actions. It is these models that guide people's actions and describe their intuitive perception of the world around them, rather than the theories they explicitly espouse.

Argyris' theory, that people have mental models that determine how they will act in situations, recognises a discrepancy between people's actions and the theories they claim to espouse. On the one hand is the 'espoused theory', the words used, when people are asked how they would behave under certain circumstances, to convey what they do or think. On the other hand is the 'theory-in-use', the theory that actually guides our actions (Argyris, 1980).

Argyris also argues that learning involves the detection and correction of errors. When something goes wrong, an initial port of call for many people is to look for another strategy that will address and work within the governing variables. When our mental models go unexplored, we don't change our decisions and so we won't get new results or shift in the way in which strategies and consequences are framed.

In single-loop learning we change our decisions, but we leave our underlying mental models and decision rules unchanged. In double-loop learning the response is to question governing variables themselves – subjected to critical scrutiny. By questioning the governing variables themselves we change our underlying mental models and decision rules to better serve us within the complexity of the actual classroom situation and according to the problems we want to solve (Argyris & Schön, 1974).

Therefore it is essential that teachers are supported and exposed to the opportunity for the acquisition of skills which will enable them to be actively involved with their own learning process and able to manage their own learning – thus becoming life-long learners, a prerequisite of our modern society (Bolhuis, 2003:328; Oswald, 2003:1).

3.3 Distinctive characteristics of a Professional Learning Community

Firstly, the different viewpoints of researchers about the characteristics of a PLC in literature will be studied and compared. Each characteristic will then be discussed as a part of a PLC structure: how this specific characteristic contributes to supporting and providing members of a PLC with opportunities to interact with and support one another as active participants, with the intention of moving their organisation in a specific direction, guided by clear and established benchmarks of progress and milestones on their improvement journey.

Professional learning communities have evolved as a way of supporting teachers to rethink their own practice, to construct new classroom models, roles and expectations and to teach in ways they have never taught before (Darling-Hammond & McLaughlin, 1995).

As Morrissey (2000:10) states, "Rather than becoming a reform initiative itself, a PLC becomes the support structure for schools to continuously transform themselves through their own internal capacity."

According to Huffman and Hipp (2003:4), the reason why school reforms often fail is because of a lack of attention to building a school culture that supports teacher development. Therefore teachers and schools collectively need certain factors and a specific approach in order to establish a predisposition for support to become learning organisations. These factors refer to the way of thinking and interaction in an organisation, and are represented by the five disciplines of Senge: system thinking, building a shared vision, personal mastery, mental models, and team learning. 'Approach' refers to the norms of collaboration and participation in a context that support teachers in their professional endeavours and their collaborative efforts (Hall & Hord, 2011:22, 26).

The data for this research, from literature's discussions of the characteristics of a PLC, will be arranged from researchers' earliest accepted declarations or versions to the most recent. Mouton (2001:92) indicates that by following this method, the earliest debates on and viewpoints of the characteristics of a PLC, until the present, may be studied and compared. By means of a comparative study of the characteristics of a PLC in chronological order, this research can:

- determine to what extent the various declarations of characteristics concur or differ; and
- determine to what extent the characteristics had – in time – remained the same or had changed.

Most of the literature is centred on the five dimensions of a PLC (supportive and shared leadership; shared values and vision; collective learning; supportive conditions; shared practice) of Hord (1997:26). The reason for this is that her 1997 research identifies five research-based characteristics of a PLC, influenced by Senge's (1990) learning organisations and cultures. The five dimensions formed the point of departure, as foundational principles, for researchers, who had worked with a PLC through their own research and practice (InPraxis Group Inc., 2006:11).

Authors and researchers in literature present a combination of declarations of the characteristics of a PLC as necessary to their descriptions of a PLC, and within their unique context. Some overlap exists among these declarations, but while they do provide considerable benefit, it is arguable that each declaration only provides a view of a PLC within a certain context.

For the purpose of this research, the models of DuFour *et al.*, (2008) and the Annenberg Institute for School Reform (2003:3-4) are used to analyse literature and research on PLCs. The reasons for using the above models are:

- The Annenberg Institute for School Reform at Brown University engaged in intensive work with urban school systems in the United States in supporting and encouraging the use of professional learning communities as a central element for effective professional development (as part of a comprehensive reform initiative to improve educational experiences and opportunities for learners and students from low-income backgrounds). Their research can guide this research, in supporting and encouraging the use of professional learning communities in multigrade schools, which also work with learners from low-income backgrounds.

- DuFour and co-researchers are among the foremost authorities on applying PLC principles in the real world of schools and have contributed to numerous professional and scholarly journals.
- The above research used and adapted the five dimensions of Hord's research-based characteristics of a PLC as a point of departure for their research.
- The research of DuFour *et al.* (2008) focuses on bridging the knowing – doing gap, and changes are not viewed as the adoption of new programmes or the implementation of an innovative practice. The significance of their research for this thesis is that their characteristics of a PLC focus on guiding a PLC to become a support system for schools, and to continuously transform themselves through their own internal capacity.
- Their descriptions and adaptation of the characteristics support a collaborative culture with the focus on learning; a collective enquiry into best practice and current reality; an action orientation: learning by doing; and a commitment to continuous improvement – addressing a need in multigrade education identified in Chapter Two of this thesis.
- DuFour *et al.* (2008:22) also view change as the challenge of impacting and reculturing the assumptions, beliefs, expectations and habits that constitute the norm. They argue that the problem with improving schools is that strategies often get filtered through the mental models and mythology of well-intended teachers who are ultimately required to do things differently.
- The research of the Annenberg Institute of School Reform is an example of an approach that emphasises system-wide reform initiatives and large-scale change (InPraxis Group Inc., 2006:11).

The overall premise of their models of a PLC is that teachers must work collectively to build a professional learning community, and to achieve this they must create infrastructures that enable collaborative practices. Their models, selected for this research, describe a PLC as an infrastructure for deliberate and collective planning with the capacity to alter the professional practices, beliefs and understanding of teaching. They categorise their models into three distinctive themes: 1) a solid foundation consisting of collaboratively developed and widely shared mission, vision, values and goals; 2) collaborative teams that work inter-dependently to achieve common goals; and 3) a focus on results as evidence by a commitment to continuous improvement. Embedded within these three themes they have outlined six key elements which serve as the conceptual framework for their models: a supportive and shared leadership capacity; shared mission, vision, values and goals; a

collaborative culture with the focus on learning; collective enquiry into best practice and current reality; action orientation: learning by doing; and a commitment to continuous improvement.

As a starting point for this research, the declaration of the five critical elements of a PLC by Kruse, Louis and Bryk (1994) was accepted as the earliest declaration by a researcher on the topic. The declaration of the characteristics in the publication Guiding Professional Learning Communities: Inspiration, challenge, surprise, and meaning by Hord *et al.* (2010), is viewed as the most recent declaration. The reason for this is that it is the latest publication about a PLC which the researcher – during his research – could find for the identification of the characteristics of a PLC (Table 3.4).

The descriptions of the characteristics of a PLC in literature reviewed (Table 3.4) from 1994 to the present list a combination of characteristics that need to be considered for this research. Although some declarations do overlap, each author's declaration defines the specific characteristics of a PLC in its own and unique context.

The significance of this comparison of characteristics of a PLC (Table 3.4) is:

- The characteristics of a PLC were identified and used by several authors and researchers since 1994 in different contexts, and they emphasise these characteristics as essential components of a PLC.
- The findings of authors and researchers confirm the relevance of using the characteristics of a PLC as enumerated by DuFour *et al.* (2008) and The Annenberg Institute for School Reform (2003) as a foundation for this research.
- Although each author's declaration of the characteristics defines the specific characteristics of a PLC within its own context, the basic concept of the characteristics of a PLC remains the same.
- The various declarations of the characteristics show the adaptability of the various characteristics of a PLC in different contexts.
- The different formulations of the same characteristics of a PLC by various authors and researchers contribute to a richer understanding of a specific characteristic of a PLC.

Table 3.4: Dimensions of a PLC (Adopted from Bolam *et al*., 2005:134-139; InPraxis Group Inc., 2006:9-10; DuFour *et al.*, 2008:15-17; Hord *et al.*, 2010:27, 58-59)

Characteristics of a PLC based on research of DuFour *et al.*, 2008 and the Annenberg Institute for School Reform, 2003	**Kruse *et al.* (1994)**	**Hord (1997)**	**DuFour and Eaker (1998)**	**Senge, Cambron-McCabe, Lucas, Smith, Dutton, Kleiner (2000)**	**The Annenberg Institute for School Reform (2003)**	**Berlinger-Gustafson (2004)**	**Patterson and Rolheiser (2004)**	**Bolam et al. University of Bristol (2005)**	**DuFour *et al.* (2008)**	**Hord *et al.* (2010)**
Supportive and shared leadership capacity	*Teacher empowerment and school autonomy, supportive leadership.*	*Shared leadership structures in which administrators and teachers question, investigate and seek solutions for school improvement.*		*Personal-mastery: articulate a coherent image of personal vision, expanding personal capacity.*	*Building internal capacity for leadership necessitates that groups share responsibility for leadership. This means building the capacity of school, district and community leaders to learn together and construct meaning and knowledge needed to support collaboration around improved instructional practices.*	*The collegial and facilitative participation of the principal, who shares leadership, has the ability to facilitate the work of staff and the ability to participate without dominating.*	*Build capacity for shared leadership.*	*The strategic and crucial importance of leadership and management in promoting the overall processes of creating, developing and sustaining an effective PLC. Commitment to actively build and maintain mutual respect and trust as well as to encourage mutual support amongst all staff.*		*Principal leadership and participation are key to establishing a schoolwide PLC. The principal plays a strong directing role at the initiation of the PLC, then steps back to support leadership opportunities and leadership development of the staff.*

Table 3.4: Dimensions of a PLC (Continuation)

Characteristics of a PLC based on research of DuFour *et al.*, 2008 and the Annenberg Institute for School Reform, 2003	**Kruse *et al.* (1994)**	**Hord (1997)**	**DuFour and Eaker (1998)**	**Senge *et al.* (2000)**	**The Annenberg Institute for School Reform (2003)**	**Berlinger-Gustafson (2004)**	**Patterson and Rolheiser (2004)**	**Bolam et al. University of Bristol (2005)**	**DuFour *et al.* (2008)**	**Hord *et al.* (2010)**
Shared mission, vision, values and goals	*Collective focus, shared norms and values, trust and respect.*	*Values are embedded in day-to-day actions. Learning community engages and develops commitment and talents.*	*A solid foundation consisting of collabora-tively developed and widely shared mission, vision, values and goals.*	*Shared vision: focus on mutual purpose to nourish a sense of commitment.*	*Creating overlapping communities of practice; sharing a mission, vision and values focused on improved practice and student outcomes.*	*A shared vision developed from staff's unswerving commitment to students' learning that is consistently articulated and referenced for the staff's work.*	*Commit to change and reculturing, choose a meaningful focus.*	*Shared values and vision directed towards the learning of all pupils.*	*A solid foundation consisting of collabora-tively developed and widely shared mission, vision, values and goals.* **Mission** - Why do we exist? **Vision** - What do we hope to become? **Values** - What commitments must we make to create the school that will improve our ability to fulfil our purpose? **Goals** - What goals will we use to monitor our progress?	*Shared beliefs are the foundation for the shared values members hold. The vision is consequently grounded in these values. A collaborative process should develop the shared vision.*

Table 3.4: Dimensions of a PLC (Continuation)

Characteristics of a PLC based on research of DuFour *et al.*, 2008 and the Annenberg Institute for School Reform, 2003	**Kruse *et al.* (1994)**	**Hord (1997)**	**DuFour and Eaker (1998)**	**Senge *et al.* (2000)**	**The Annenberg Institute for School Reform (2003)**	**Berlinger-Gustafson (2004)**	**Patterson and Rolheiser (2004)**	**Bolam et al. University of Bristol (2005)**	**DuFour *et al.* (2008)**	**Hord *et al.* (2010)**
A collaborative culture with the focus on learning	*Collaboration, reprivatisation of practice, socialisation.*	*Collectively seeking new knowledge and applying it to work, resulting in collaborative relationships.*	*Collaborative teams that work independent-ly to achieve common goals.*	*Team learning: group interaction to transform collective thinking and learning and mobilise energies and actions to achieve common goals.*	*Ensure content-based, outcomes-focused experiences; ongoing opportunities for learners to increase subject-matter knowledge. Acquire strategies for instruction and assessment. Examine current research and/or district policies to support instruction. Observe, analyse and coach peers and provide ideas and feedback to each other.*	*Collective learning among staff and application of that learning to solutions that focus on students' learning. Move beyond procedure to strategies for improvement based on high standards and best practices that are shared, public and applied.*	*Establish a safe and caring environment Be open to possibilities and take risks. Establish trust. Model collaborative work.*	***Collective responsibility*** *for pupil-learning and create conditions for pupils to feel the confidence to learn.* ***Collaboration*** *in activities* ***focused on*** *pupil-****learning*** *and mutual professional learning.* ***Professional learning: individual and collective*** *Teachers in their schools learn together with colleagues and take responsibility for their own learning.*	*Collabora-tive culture with a focus on learning.*	*Collectively seeking new knowledge and applying it to work, resulting in collaborative relationships.*

Table 3.4: Dimensions of a PLC (Continuation)

Characteristics of a PLC based on research of DuFour et al., 2008 and the Annenberg Institute for School Reform, 2003	***Kruse et al. (1994)***	***Hord (1997)***	***DuFour and Eaker (1998)***	***Senge et al. (2000)***	***The Annenberg Institute for School Reform (2003)***	***Berlinger-Gustafson (2004)***	***Patterson and Rolheiser (2004)***	***Bolam et al. University of Bristol (2005)***	***DuFour et al. (2008)***	***Hord et al. (2010)***
Collective enquiry into best practice and current reality & Learning by doing & A commitment to continuous improvement.	*Reflective learning.*	*Share personal practice through enquiry-oriented practice and collegial coaching.*		*Mental models: reflection and enquiry skills focused around developing awareness of attitudes and perceptions.*		*Supportive conditions: the conditions determine when, where and how the staff regularly come together as a unit to do the learning, decision-making, problem-solving and creative work.*	*Learn about change; specifically studying the change process helps increase the chance of sustaining change initiatives. Encourage professional discussion.*	*Reflective professional enquiry.*	***Collective Enquiry into best practice and current reality*** *Best practices about teaching and learning.* ***Action orientation: Learning by doing*** *Learning by doing develops a deeper and more profound knowledge and greater commitment than learning by reading, listening, planning.* ***A commitment to continuous improvement – ongoing cycle*** *The goal is not simply learning a new strategy, but rather creating conditions for perpetual learning.*	*Share personal practice through enquiry-oriented practice and collegial coaching.*

3.3.1 Supportive and shared leadership

In a study identifying greatness in organisations, Collins (2001) contends that effective leaders focus on building the capacity of their organisations to improve continuously in developing the next generation of leaders. Pfeffer and Sutton (2006) arrive at a similar conclusion, asserting that leaders have the most positive impact when they focus on viewing their jobs as the establishing of conditions and preconditions for others to succeed.

For this to happen Senge *et al.* (2000:15) argue that principals must become a "lead teacher and lead learner, and steward of the learning process as a whole". Principals must move beyond the traditional leadership style, as primary decision makers, to a style of developing and supporting people, each with his/her own mental models and beliefs about schooling and learning. According to DuFour (2001), there are fundamental steps principals can take, as staff development leaders, to embed collaboration and leadership capacity in the structure and function of their schools. They must:

- provide time for collaboration;
- identify critical questions that should guide the work of the collaborative teams;
- guide the teams to create products as a result of their collaboration; and
- provide teams with relevant data and information.

Hall and Hord (2011:146) argue that innovation-related interventions and change-facilitation support and assistance may be delivered by any person who assumes the role and responsibilities of the change facilitator. Working as a PLC allows for the traditional role of omnipotent principal to be replaced with a shared leadership model where principals, along with teachers question, investigate and seek solutions for school improvement. Enhancing shared leadership capacity empowers all members of a PLC to share in the vision and mission of the school and make effective decisions that positively affect learning and achievement (InPraxis Group Inc., 2006:11).

In a wide-ranging review of the literature focused on the actions and behaviour of leaders who were facilitating change, Hall and Hord (2011:147-152), identify six functions (Figure 3.4) that constitute the job description of the change facilitator deemed necessary for making change happen.

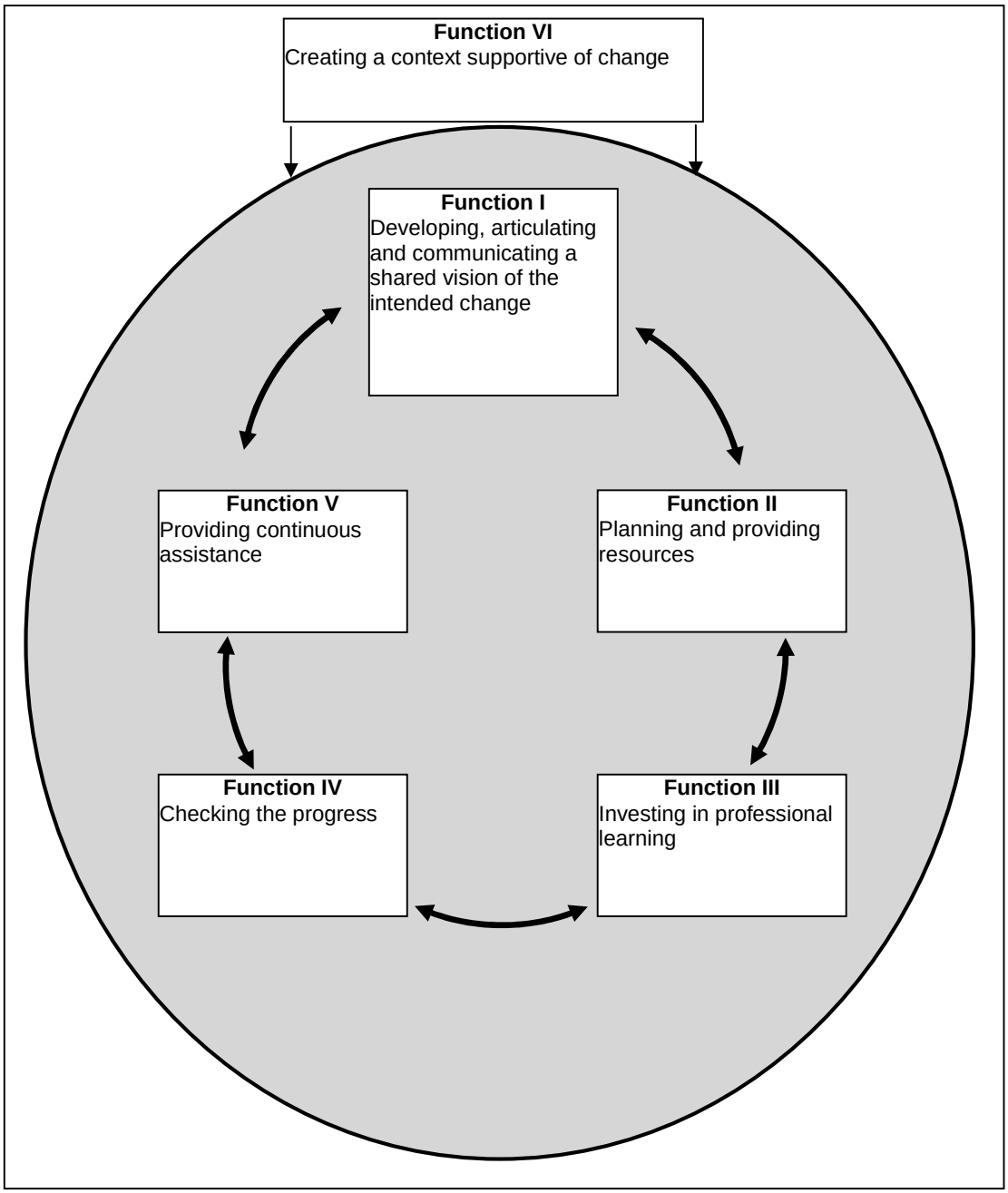


Figure 3.4: Six functions of interventions (Adapted from Hall & Hord, 2011:148)

These six functions provide the practical framework to facilitators for supporting and guiding change:

- There is a written product that represents the creation of a vision of the change (Function I).
- It may be used for planning and providing resources (Function II).
- It may provide clarity for identifying professional development needed to reach the actions (Function III).

- It may be used by the facilitator as an instrument to ascertain where each individual is in the change effort (Function IV).
- It allows for appropriate planning to support individuals moving closer to the ideal variation (Function V).
- It may be used to produce a guide to facilitate designing interventions to enable a more supportive context in the organisation (Function VI).

Serving as a framework, the CBAM (Figure 3.3) of the R&DCTE at the University of Texas helped implementation and change facilitators to identify the special needs of individuals in order to support and address those needs appropriately, based on information gathered through the model's diagnostic dimensions (Hall *et al.*, 2006:1). This helped to understand what various change facilitators were doing to address the different stages and levels which teacher were finding problematic.

In the CBAM, the change facilitator is seen as a key to assist (utilising a resource system), the individual or group for a brief or extended period of time in ways relevant to their concerns so that they become more effective and skilled in using new programmes and procedures. The change facilitator uses formal and systematic ways to probe individuals and groups to understand them. With the help of three diagnostic dimensions: the SoC, the LoU and the IC, the facilitator is informed enough to provide interventions (Hall & Hord, 1987:11-14).

The significance of this characteristic of a PLC for this research, is that it provides the tool to guide the members of a PLC to enhance shared leadership capacity to empower all members of a PLC to share in the vision and mission, and make effective decisions that positively affect learning and achievement.

3.3.2 Shared mission, vision, values and goals

Cultures do not change by mandate; clear expectations are required about what each person is expected to do to fulfil the commitments. The process of cultural change depends fundamentally on modelling the new values and behaviours with which you expect to displace the existing ones (DuFour *et al.*, 2008).

A fundamental characteristic of a PLC is its focus on and commitment to the learning of each learner – a focus that is grounded in a solid foundation (See Table 3.4 – shared values and vision) of a shared mission, vision, values and goals (DuFour *et al.*, 2008).

This should be a mission, vision, and values and goals that are woven into the fabric of school and community life, and are centred on the improvement of the learner's

achievement, learning and growth through the displacement of existing norms, structures and processes by others. It offers its members a purpose (mission – Why do we exist?), a clear direction (vision – What do we hope to become?), collective commitments (values – What commitments must we make to create the school that will improve our ability to fulfil our purpose?) and indicators, timelines and targets (goals – What goals will we use to monitor our progress?) (DuFour *et al.*, 2008:3,166).

This mission, vision, values and goals are not just words on a piece of paper – they drive the day-to-day work of the school and help people to move from aspirations to actions. They act like a road map that illustrates different ways of getting from point A to point B. They specify what teachers will start doing today to move their organisation in the intended direction, guided by established and clear benchmarks of progress and milestones on the improvement journey (DuFour *et al.*, 2008).

Because of the big leap from preparing to do something to actually doing it, the research team of the R&DCTE at the University of Texas found it necessary during their research to develop a methodology and a measure, called an IC Map (CBAM – see 2.3.1), to help everyone evaluating or involved in the change process, to understand what constituted the ideal in terms of an innovation and how to anticipate the variety and diversity of how individuals might implement it (Hall & Hord, 2011:42). Their research showed that an IC Map identified the different components of an innovation and the variations in the ways each could be implemented and observed in a classroom.

Hall and Hord (2011:44, 59) refer to these IC Maps (Table 3.5) as the development and application of word-picture descriptions of an innovation – what does it look like in operation and what are the individuals doing in respect of the innovation. In order for change to be successful, teachers must be able to clarify what an innovation or change actually looks like along a continuum – from high-quality implementation, to least desirable practices.

Table 3.5: Example of IC Map (Adopted from Hord *et al*., 2006:23)

Cluster name **Students' engagement with task/investigation**			
Component 1 **Students engage in mathematical task throughout the lesson (engagement, time)**			
a	**b**	**c**	**d**
Most students engage in the mathematical task, most of the time	Most students engage in the mathematical task, part of the time	Some students engage in the mathematical task; many are off task most of the time	Few students engage any of the time

The researchers of the R&DCTE refer to the "way to chart these adaptations" as an implementation bridge (Figure 3.5) with the IC Map as a research-based construction and tool to facilitate individuals and organisations in moving across the bridge. The term 'component' refers to the major operational features of an innovation (Hord *et al*., 2006:vii, 5).

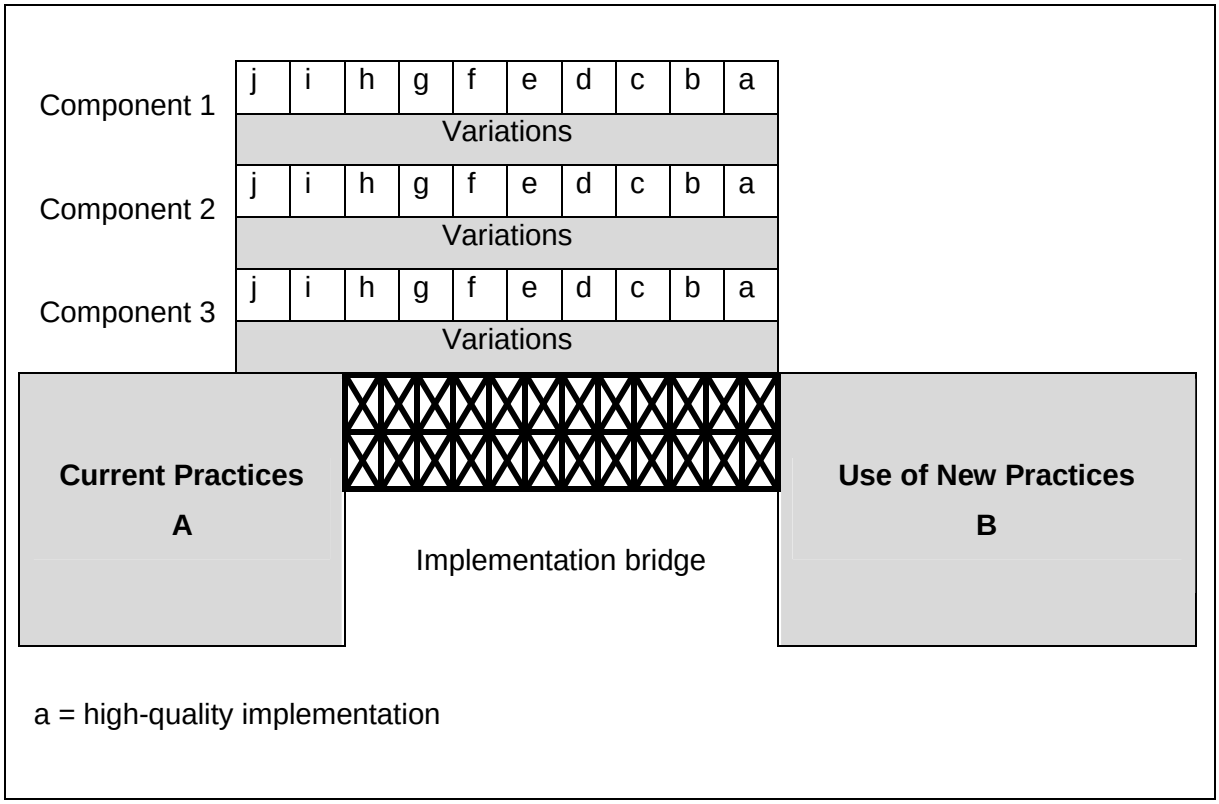


Figure 3.5: IC Map – Implementation bridge (Hall & Hord, 2011:270)

The significance of using an IC Map for this research is that it forms the essential building blocks of a professional learning community; it aids in facilitating a support system for the members of a PLC to develop and apply word-picture descriptions of their purpose (mission – Why do we exist?), their direction (vision – What do we hope to become?), collective commitments (values – What commitments must we make to create the school that will improve our ability to fulfil our purpose?) and indicators, timelines and targets (goals – What goals will we use to monitor our progress?).

The word-picture descriptions of their purpose, their direction, their collective commitments, and their indicators, timelines and targets, will act like a road map that illustrates different ways for the members of a PLC to get from point A to point B – guided by established and clear benchmarks of progress and milestones on their improvement and support journey.

3.3.3 A collaborative culture with the focus on learning

In the shift from a culture of isolation to a culture of collaboration, studies for more than 30 years have reached the same conclusion: that the most powerful impediment to school

improvement is teacher isolation, and that the single most important factor for successful school restructuring is the building of a collaborative internal environment that fosters co-operative problem-solving and conflict resolution (DuFour *et al.*, 2008:169ff).

Collaboration is the systematic process in which teachers work together, interdependently, to analyse an impact on professional practice, seeking new knowledge and ways of applying that knowledge to their work.

Blanchard (2007:172) describes the collaborative culture as "the strategic vehicle for getting work accomplished ... the vehicle for moving organizations into the future ...".

According to Berry *et al.* (2005) the learning community structure, in spite of a vague description of their methodology, helps teachers in a rural elementary school to examine their practice through collaborative structures.

The collaborative team is the fundamental building block of an organisation to encourage and support the members of a PLC to develop a knowledge base or change their mental models, within the complexity of the actual situation and according to the problems that they want to solve (Hord *et al.*, 2010).

By collaboratively sharing responsibility for learning (See Table 3.4 – a collaborative culture with the focus on learning), a PLC confronts the issue of isolation and promotes interactions among the members of a PLC (DuFour *et al.*, 2008:15-16; Griffith, 2009:35). According to DuFour *et al.* (2008:170), the collaborative culture and systematic support embedded in a PLC have significant benefits for the members of a PLC.

It supports the members by their having someone to turn to, talk to, learn from, and helps them to achieve their goals. Everyone therefore operates within a built-in system of accountability, because each member is expected to contribute towards the continuous improvement of the team and school.

Hall and Hord (2011:58) contend that the more individuals are privileged to participate in dialogue and consensus about the ideal form, components and variations of an innovation, the less confusion there will be, and the greater the 'buy-in'. Through the process of a collaborative culture focusing on the critical questions of learning, namely,

- What does the innovation look like when it is in use?
- What will I see in classrooms where it is used well (or not used well)?
- What will teachers and learners be doing when the innovation is in use?

Individuals feel that they are contributing to an innovation that they will use and that they have a commitment to its implementation.

The significance of this specific characteristic of a PLC for this research is that it forms the essential building blocks of a professional learning community, that the collaborative team encourages and supports members of a PLC to develop a knowledge base or to change their mental models by acting as a strategic vehicle for getting the work accomplished, and for moving the organisation from Point A to Point B. It also supports the members of a PLC by having someone to turn to, talk to, and learn from, thereby helping them to achieve their goals. Furthermore, all members operate within a built-in system of accountability because they are expected to contribute to the continuous improvement of their team and school.

A collaborative culture with the focus on learning could, in this research, act as the strategic vehicle that allows teachers and principals in multigrade schools to reduce teacher isolation and create new ideas emanating from themselves. This implies their being involved in their own learning, as well as their having a sound comprehension of the new strategy, with the necessary follow through or support to implement it. Therefore this research supports the premise that a collaborative culture, with a strong focus on learning, should be seen as the single most important factor for successful school restructuring in multigrade schools. This will enable teachers and principles to move their organisations into the future, unleashing the potential and future role of multigrade schools as educational units in underserved rural areas.

3.3.4 Collective enquiry into best practice and current reality

Professional enquiry is informed by current research on teaching and learning. For learning to become job-embedded, teachers need to engage in collective enquiry into both best practice regarding teaching and learning as well as the reality of the current practices and conditions in their schools. This involves 'learning by doing', reflecting on the experience, and then generating and sharing new insights and learning with oneself and others (Huffman & Hipp, 2003:10).

DuFour *et al.* (2008:464) define collective enquiry as the process of building shared knowledge by clarifying the questions that a group will explore together and allowing them to conduct a candid clarification of the current practices and to enquire into best practices about teaching and learning. Professional learning communities engage members of a PLC in processes that collectively seek new knowledge and ways of applying that knowledge to their work (Morrissey, 2000:6).

In order to support the members of a PLC in adopting and observing an innovation, and in clarifying what the innovation or change actually looks like along a continuum of high-quality implementation to least desirable practices, a PLC must engage the members in the process that will support them in (a) clarifying the questions that they will collectively explore together, (b) allowing them to conduct a candid clarification of their current practices, and (c) allowing them to enquire into best practices about teaching and learning (DuFour *et al.*, 2008:16).

With the mission and the vision focusing on why an organisation exists, and the collective culture focusing on how each person can contribute to the collective effort, the collective enquiry into best practice and current reality will convince the members of a PLC to shift from a focus on teaching to a focus on learning – learning that will help members to understand what change is all about and to understand the new parts of change (DuFour *et al.*, 2008).

Hord (Roy & Hord, 2004) argues that IC Maps bring groups together to discuss an innovation and debate it. As they do this, they are clarifying what an innovation is, and understanding what the change is all about; this helps them to identify and understand the new parts. This interactive and iterative process is guided by focusing on three questions:

- What does the innovation look like when it is in use?
- What will I see in classrooms where it is used well (or not used well)?
- What will teachers and learners be doing when the innovation is in use?

In constructing an IC Map, the IC Mapping process acts as a scaffolding to support the learning process. By creating a clear picture of the next step for refining implementation, it assists those who manage or supervise school-based teachers to assess the learning needs of the teachers (Killion, 2007:3). By focusing on the three questions, it guides the process of collective enquiry (Figure 3.6):

- to focus on identifying the components and major operational features of an innovation;
- to focus on reviewing all of the available printed material about the programme;
- to observe classrooms and similar practices where an innovation is in use or must be implemented; and
- into best practice and current reality (Hall & Hord, 2011:58-59).

When teachers work together in teams that are engaged in collective enquiry into best practice and current reality, it serves as a catalyst for action (DuFour *et al.*, 2008:16).

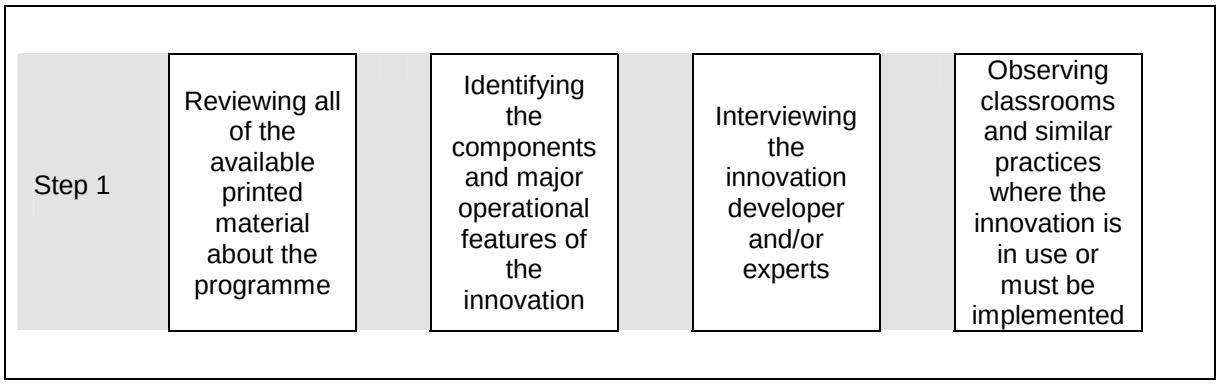


Figure 3.6: IC Mapping process as a scaffolding to support the learning process (Adapted from Hord *et al*., 2006:14; Hall & Hord, 2011:59)

The significance of this characteristic of a PLC for this research is that it addresses a major challenge for multigrade education and professional development in respect of teachers in multigrade schools: that knowledge, obtained at a workshop, suggests a potential solution for generic learning dilemmas in schools without helping and supporting multigrade teachers to understand and address these dilemmas that emerge as they implement the new practices within multigrade classrooms.

This specific characteristic of a PLC for this research provides a tool to guide a PLC in engaging and supporting its members in collective enquiry into (a) best practices about teaching, (b) a candid clarification of their current practices, and (c) an honest assessment of their learning to move beyond discussions, and help them to focus on areas that can contribute to significant improvement (DuFour *et al*., 2008:16). This will guide the members of a PLC in this research to move their organisation in the intended direction, guided by established and clear benchmarks of progress and milestones, on their improvement journey.

3.3.5 Action orientation: learning by doing

> "Without action and follow-through, we have plans and dreams" (Hord & Sommers, 2008:72).

According to Peter Block (DuFour *et al.*, 2008:413), one of the world's leading organisational theorists, people use the question, "But how do we do this?" as a favourite defence against taking action because they look for the answers outside of themselves.

Pfeffer and Sutton (2000) came to a similar conclusion when they posited that knowing is not sufficient, that we must plan for action, and that the most effective organisations appreciate the power and necessity of learning by doing, rather than learning by training.

The reviewed research shows that members of a PLC are action-oriented (See Table 3.4). By understanding that the most powerful learning always occurs in a context of taking action, they move quickly to turn aspirations into action and visions into reality. According to Pfeffer and Sutton (2000), members of a PLC develop a deeper and more profound knowledge and greater commitment by learning by doing.

One of the fundamental building blocks of a PLC is that its members recognise that until members of the school 'do' differently, there is no reason to anticipate different results (DuFour *et al.*, 2008:16). To 'do' things differently, a PLC must support members to idealise the images of change as well as the various operational forms of the change that can be observed in the classroom.

In the process of a PLC's developing IC maps, it provides the support system to members in respect of what they must do in addressing the question, "But how do we do this?" It allows them to take action in describing the behaviours that are required for an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation (Hord *et al.,* 2006:10). Such action should focus on:

Step 1: Reviewing of the available printed material about the programme; identifying the components and major operational features of the innovation; interviewing the innovation developers and/or experts; observing classrooms and similar practices where the innovation is in use or must be implemented.

Step 2: Sorting information; developing a list of components, dimensions and variations.

Step 3: Interviewing a small number of users; observing a small number of users.

Step 4: Adjusting and expanding the list of components, dimensions and variations; drafting IC Map.

Step 5: Interviewing developer, referring to components and variations on draft; making final revisions.

Step 6: Implementing the innovation; interviewing and observing a range of users; adjusting and expanding the list of components, dimensions and variations; drafting IC Map; interviewing developers, referring to components and variations on draft; making final revisions (Step 6: Iterative cycles of testing and refinement of solutions in practice.) (Adapted from Hord *et al*., 2006:14; Hall & Hord, 2011:59).

The significance of this specific characteristic of a PLC for this research is the fact that it provides the tool to guide a PLC to take action in describing the behaviours that are required

by an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation. By allowing them to understanding that the most powerful learning always occurs in a context of taking action, teachers in multigrade schools can move quickly to turn their aspirations into action and their visions into reality.

It will also address one of the major challenges of multigrade education and professional development for teachers teaching in multigrade schools – the failure of what needs to be done (knowledge) to result in action or behaviour that is consistent with that knowledge in a multigrade classroom.

3.3.6 Commitment to continuous improvement

An inherent part of a PLC culture is the ongoing cycle of constant search for a better way to achieve the goals and accomplish the purpose of the organisation. According to DuFour *et al.* (2008:156), the central challenge of every organisation's improvement process is to change people's behaviour to allow them to displace existing norms, structures and processes and substitute others. One of the most powerful tools to meet this challenge is to address the issue of collective commitments to continuous improvement.

Collective commitments shift the focus from the mission and the vision (focusing on the organisation), to a focus on members and how each member can contribute to the collective effort, because it is the promises members of a PLC make about what they are prepared to do *now* to create the school that represent their shared hopes for themselves (DuFour *et al.*, 2008:151).

Promises are those that engage each member of a PLC in an ongoing cycle of:

- gathering evidence of current learning;
- developing strategies and ideas;
- implementing those strategies and ideas;
- analysing the impact of the changes; and
- applying the new knowledge in the next cycle to enhance continuous improvement (DuFour *et al.*, 2008:17, 465).

The significance of this specific characteristic of a PLC for this thesis is that it provides the tool to guide the members of a PLC to analyse the impact of the changes and apply the new knowledge in the next cycle.

3.4 Conceptual framework

This section extrapolates from literature, for a better understanding of the provision and implementation of support systems to members of a PLC (Section 3.1 – 3.3), to form a conceptual framework to guide this research and the interpretation of the findings. In order to address the objectives of this research, it is clear that the conceptual framework for this research must allow for developing specific research questions that explore the characteristics of the role that a PLC plays in supporting and guiding a collaboration of multigrade teachers and principals in the context of multigrade classrooms, as well as the needs to be addressed in multigrade schools in South Africa.

The conceptual framework in this research employed a system theory approach, grounded in the general system theory (GST). The general system theory (GST) emerged from the work of Ludwig von Bertalanffy (Von Bertalanffy, 1972), as a response to the increasing fragmentation and duplication of scientific and technological research and decision-making in the first half of the 20th century. Prior to this, the world and all that it contains was seen as an assembly of small and distinct parts, fit largely for analysis and study in isolation. It was also then the belief that it was better to have specific and intimate knowledge of smaller and more well-defined items, than general and abstract knowledge of larger and less well-defined ones. This resulted in drawing the attention to the parts regardless of their position within the ensemble, instead of focusing on the interacting and integrated ensemble, the 'system' (Laszlo & Krippner, 1998:54).

The system approach attempts to view the world in terms of irreducibly integrated systems, focusing attention on the whole, as well as on the complex interrelationships among its constituent components. According to Ackoff (1981:15-16), a system (Table 3.6) is a set of two or more interrelated elements (components) with certain properties. Rapoport (1968:457) argues that the task of general system theory is to find the most general conceptual framework in which a scientific theory or a technological problem can be placed without losing the essential features of the theory or problem. It is a conceptual framework that:

- provides the constructs for interpreting the processes of change in open, dynamic systems and is infused by studies that shed light on how we navigate the diachronic terrain of physical and social reality; and
- creates the conditions in which individuals and groups may gain the evolutionary competence needed to co-create sustainable evolutionary pathways (Laszlo & Krippner, 1998:72).

Table 3.6: A system (Ackoff, 1981, 15-16)

A system is a set of two or more interrelated elements with the following properties: 1. Each element has an effect on the functioning of the whole. 2. Each element is affected by at least one other element in the system. 3. All possible subgroups of elements also have the first two properties.

The conceptual framework in this research employed a system theory approach that treats a problem from a wide perspective by taking all the components into consideration and focusing on the interactions between the components of this problem (Hamilton, 1997). The conceptual framework aims to align the key concepts and to provide a structure to understand how to improve support and guidance to multigrade teachers and principals in multigrade schools in the Western Cape, South Africa. The characteristics and processes proposed by the framework are anchored by relevant context-bound literature. The framework identifies characteristics needed in a programme to increase support and guidance to multigrade teachers and principals with a specific focus – a focus that supports and guides members of a PLC in what needs to be done (knowledge) in multigrade education to result in action or behaviour that is consistent with that knowledge in the actual multigrade classrooms of multigrade schools.

Three conceptual models are influential in informing and identifying the factors in and approach to constructing the conceptual framework for this research. The first research model, the PLC, is grounded in the premise that teachers must work collectively to build a professional learning community, and to achieve this, they must create infrastructures which enable collaborative practices (Section 3.3). The model of Senge (1990), DuFour and Eaker (1998) and The Annenberg Institute for School Reform (2003) (Figure 3.7) describes the PLC with the guiding principles.

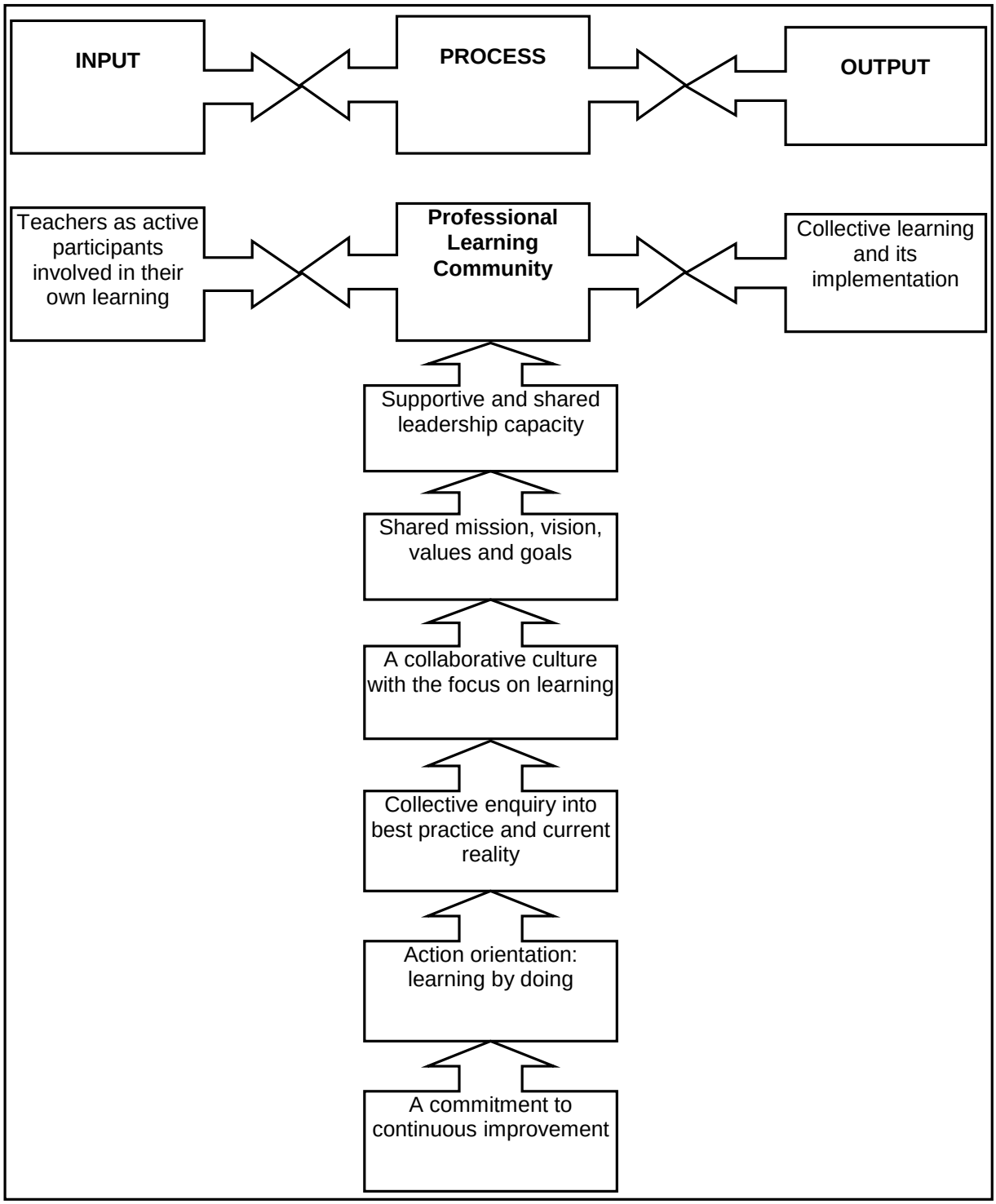


Figure 3.7: Professional Learning Community model (Adapted from Senge, 1990; DuFour & Eaker, 1998; Annenberg Institute for School Reform, 2003)

The characteristics are portrayed as a ladder in the centre, depicting how the characteristics come together in a professional learning community. Following the 'system thinking' framework approach of principles building on practices of Senge, a series of blocks representing the input (teachers as active participants involved in their own learning and understanding in the complexity and context of the actual classroom situation of the

teachers, according to the needs they want to address), the process, and the desired output (effect on collective learning and its implementation in a classroom), are displayed across the top from left to right. The PLC characteristics are the processes supporting and guiding teachers as active participants in their own learning and understanding within the complexity and context of classrooms, according to the needs they want to address.

The model emphasises the interconnectedness of the teaching and learning process within a school environment. The teacher is impacted by the collaboration and support process directed by the professional learning community. The output of teacher support and guidance is measured by the effect on collective learning and its implementation in a classroom.

The second conceptual model, the CBAM (Section 3.3.1), evolved in the 1970s during a long-term study from 1970 to 1986 from the work of Fuller (1969) in response to the innovation focus approach to educational implementation and change (George, Hall & Stiegelbauer, 2006:1). The CBAM is designed to support research into implementing an educational innovation and particularly focuses on supporting and guiding teachers.

In the CBAM, the change facilitator (Figure 3.8) acts as a support system (Section 3.3.1) to assist, utilising a resource system, the individual or a group for a brief or extended period of time in order to help, assist and support them in ways relevant to their concerns so that they become more effective and skilled in using new programmes and procedures.

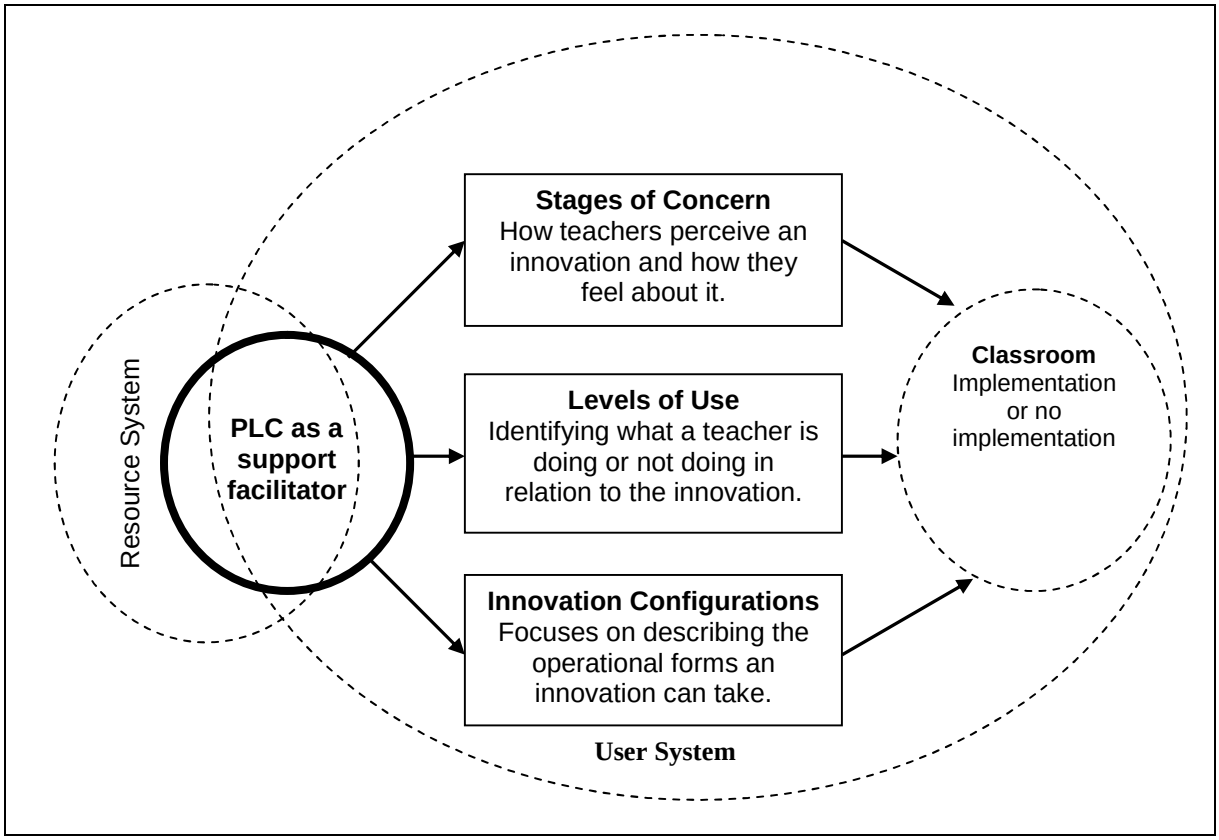


Figure 3.8: Place of a PLC (Adapted from the CBAM of Hall *et al.*, 2006:2).

A facilitator that:

- creates a context supportive of change;
- provides time for collaboration;
- identifies critical questions that must guide the work of the collaborative teams;
- develops, articulates and communicates a shared vision of the intended change;
- plans and provides resources;
- invests in professional learning;
- guides the teams to create products as a result of their collaboration;
- checks the progress;
- provides teams with relevant data and information; and
- provides continuous assistance (Hall & Hord, 2011:148).

The significance of the CBAM for developing the conceptual framework for this research is that the model:

- provides existing structures, approaches, procedures and levels of use to support and guide teachers (Table 3.3 and Section 3.2.3) that this research can further contribute to; and
- provides the place and role of a PLC, as a facilitator supporting teachers in a PLC of what needs to be done (knowledge) in multigrade education to result in action or behaviour that is consistent with that knowledge in the actual multigrade classroom in multigrade schools (Section 3.3.6).

The third conceptual model, the Provisional Model of a School Operating as an Effective PLC (Figure 3.9), was developed from the findings and research from the Creating and Sustaining Effective Professional Learning Communities (EPLC) project, funded by the Department for Education and Skills (DfES), the General Teaching Council for England (GTCe) and the National College for School Leadership (NCSL) from January 2002 to October 2004 (Bolam *et al*., 2005:i-ii).

Their research activities included a literature review; an analysis of questionnaire survey responses from 393 schools – representative of nursery, primary, secondary and special schools across England - including detailed statistical comparisons of key survey items with pupil outcome data; case studies in 16 school settings and three workshop conferences for representatives from the case study schools (Bolam *et al*., 2005:i-ii).

The Provisional Model portrays a professional learning community, based on the conclusions that an EPLC:

- fully exhibits eight key characteristics: shared values and vision; collective responsibility for pupils' learning; collaboration focused on learning; individual and collective professional learning; reflective professional enquiry; openness, networks and partnerships; inclusive membership; mutual trust, respect and support;
- is created, managed and sustained through four key operational processes: optimising resources and structures; promoting individual and collective learning; explicit promotion and sustaining of an effective PLC; leadership and management; and
- furthermore, the extent to which these four processes are carried out effectively is a third measure of overall PLC effectiveness (Bolam *et al*., 2005:i).

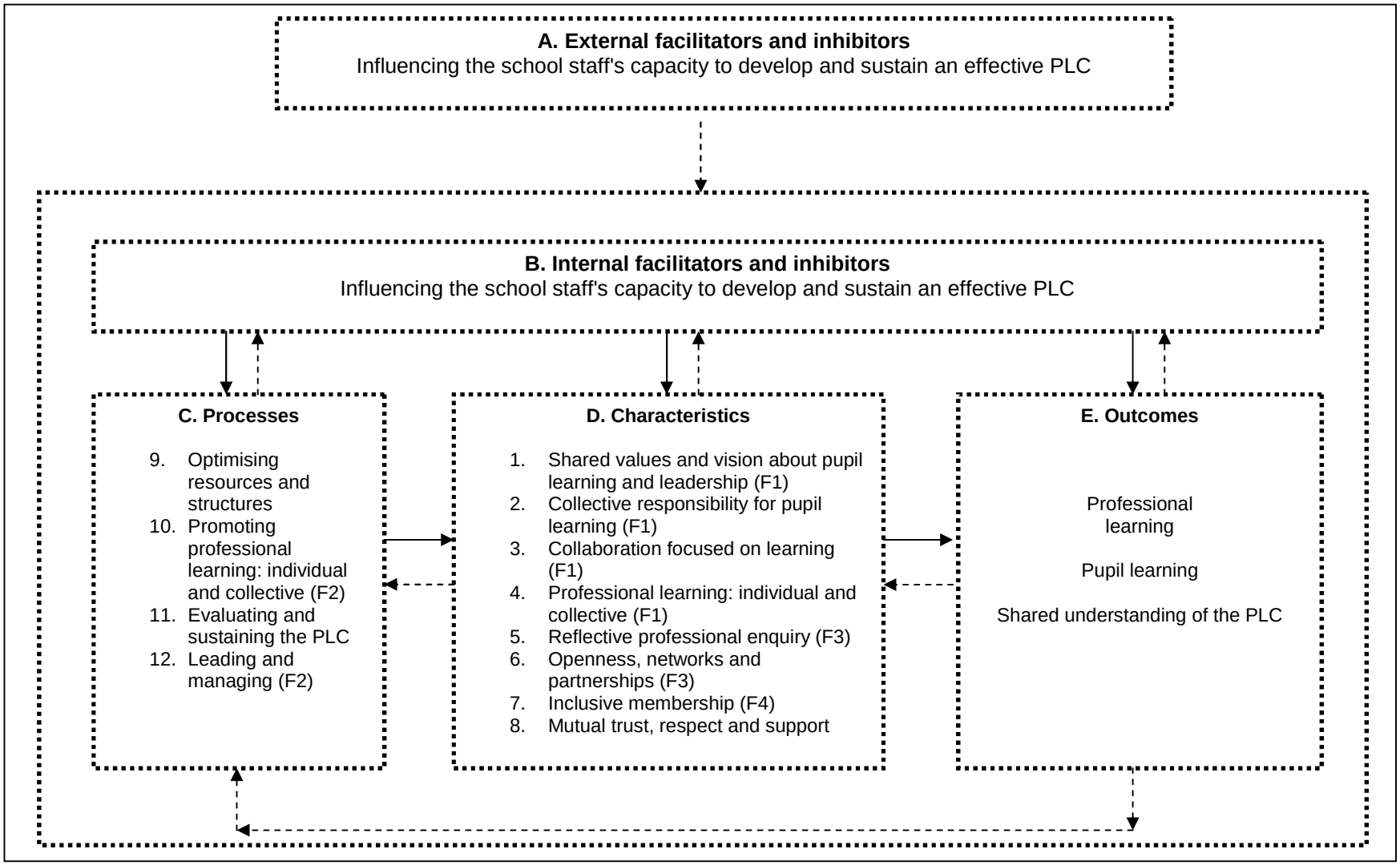


Figure 3.9: Provisional Model of a School Operating as an Effective Professional Learning Community (Bolam *et al*., 2005:152).

The significance of the Provisional Model of a School Operating as an Effective Professional Learning Community (EPLC) for developing the conceptual framework for this research is that the model:

- includes the description of the characteristics of a PLC from the research of DuFour *et al.*, (2008) and The Annenberg Institute for School Reform (2003) that are used as a basis for this research (Section 3.3);
- describes the four key operational processes to create, manage and sustain a PLC;
- indicates the presumed broad causal direction of a PLC operation (Figure 3.9 – unbroken arrows);
- sees the functioning of a PLC as cyclic and recursive (Figure 3.9 – broken arrows and Section 3.3.5); and
- provides a well-researched basis illuminating issues associated with an EPLC for further practitioners and researchers to use and to build on in their unique context.

The conceptual framework (Figure 3.10) for this research envisages teachers, involved in professional development, involved in a process of professional development through collaboration, grounded in the situational and social learning theory (Section 3.2) in the context of multigrade classrooms and the needs they want to address in multigrade schools. Situational and social learning refer to a social alliance, which entertains situational learning by placing the reasoning capacity of the teachers in a specific place, involving all teachers of the school as active participants.

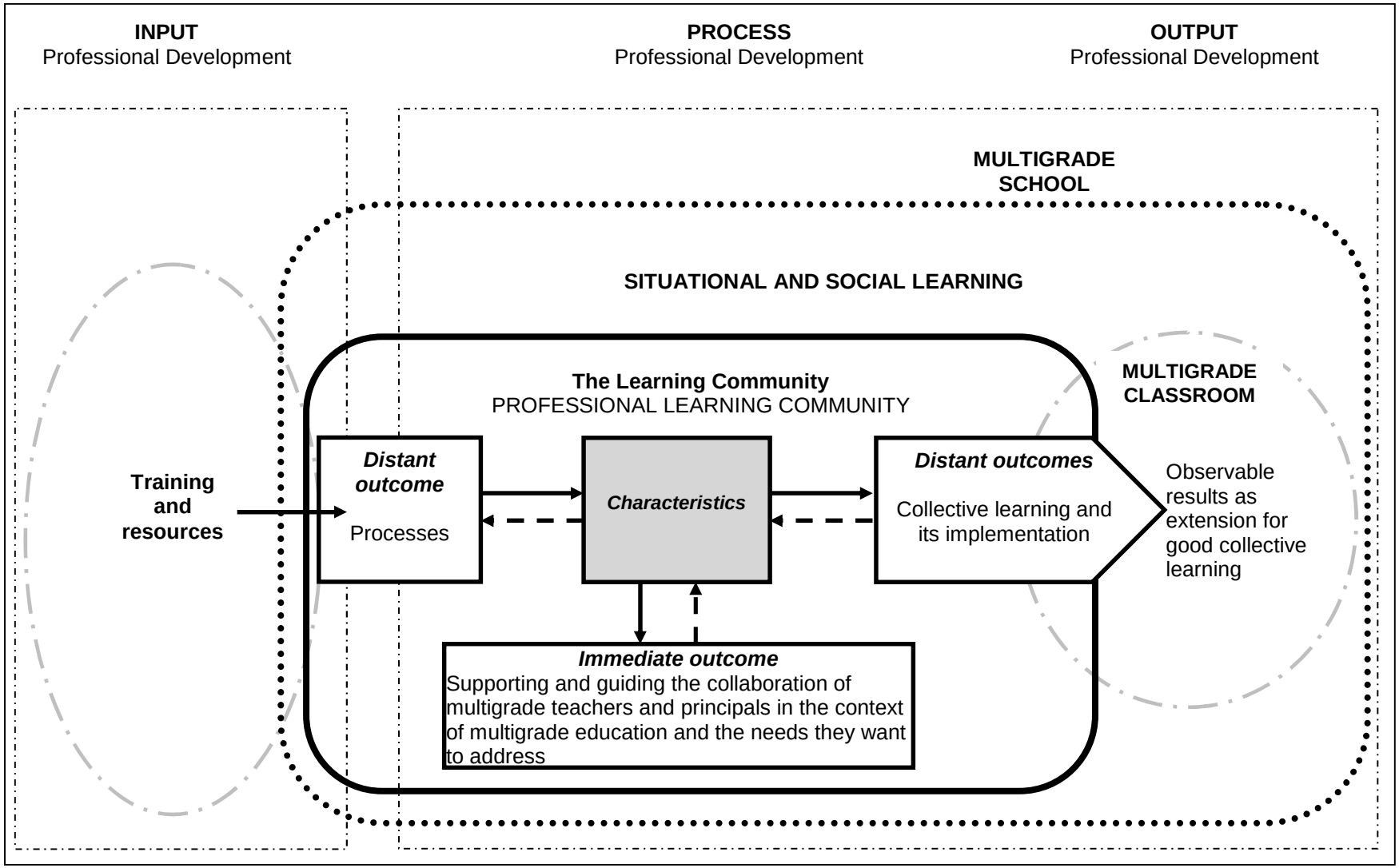


Figure 3.10: Preliminary conceptual framework of teachers operating as a Professional Learning Community

This allows for individuals to take personal action to attain potential through interaction and observation in a social context (Section 3.2.1). Through this process of personal action, the individuals create comprehension and knowledge from their own experiences by connecting them with prior knowledge, in an immediate and relevant environment and situated in a community of practice.

The learning community refers to the school and its teachers as a learning organisation, working together and learning how to improve, strengthen and promote their school. Teachers and schools collectively need certain factors and a specific approach to establish a predisposition for change and to become a learning organisation. These factors refer to the way of thinking and interaction within an organisation and are grounded in Senge's five disciplines of a learning organisation (Section 3.1). Approach refers to the norms of collaboration and participation within a context that supports teachers in their professional endeavours and collaborative efforts (Hall & Hord, 2011:22, 26).

A PLC provides the support system (Figure 3.11) for the learning community to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones on the improvement journey. By providing the characteristics and processes (informed by prior research and review of relevant literature – Section 3.3) for collaboration, participation and a way of thinking and interaction in an organisation, teachers are supported through validated principles ('how to do' guidelines or heuristics) that are available to structure and support their collaboration, collective learning and its implementation for teaching at classroom level. The characteristics act like a road map that illustrates different ways of getting from point A to point B and specify what the teachers should do to move their organisation in the intended direction.

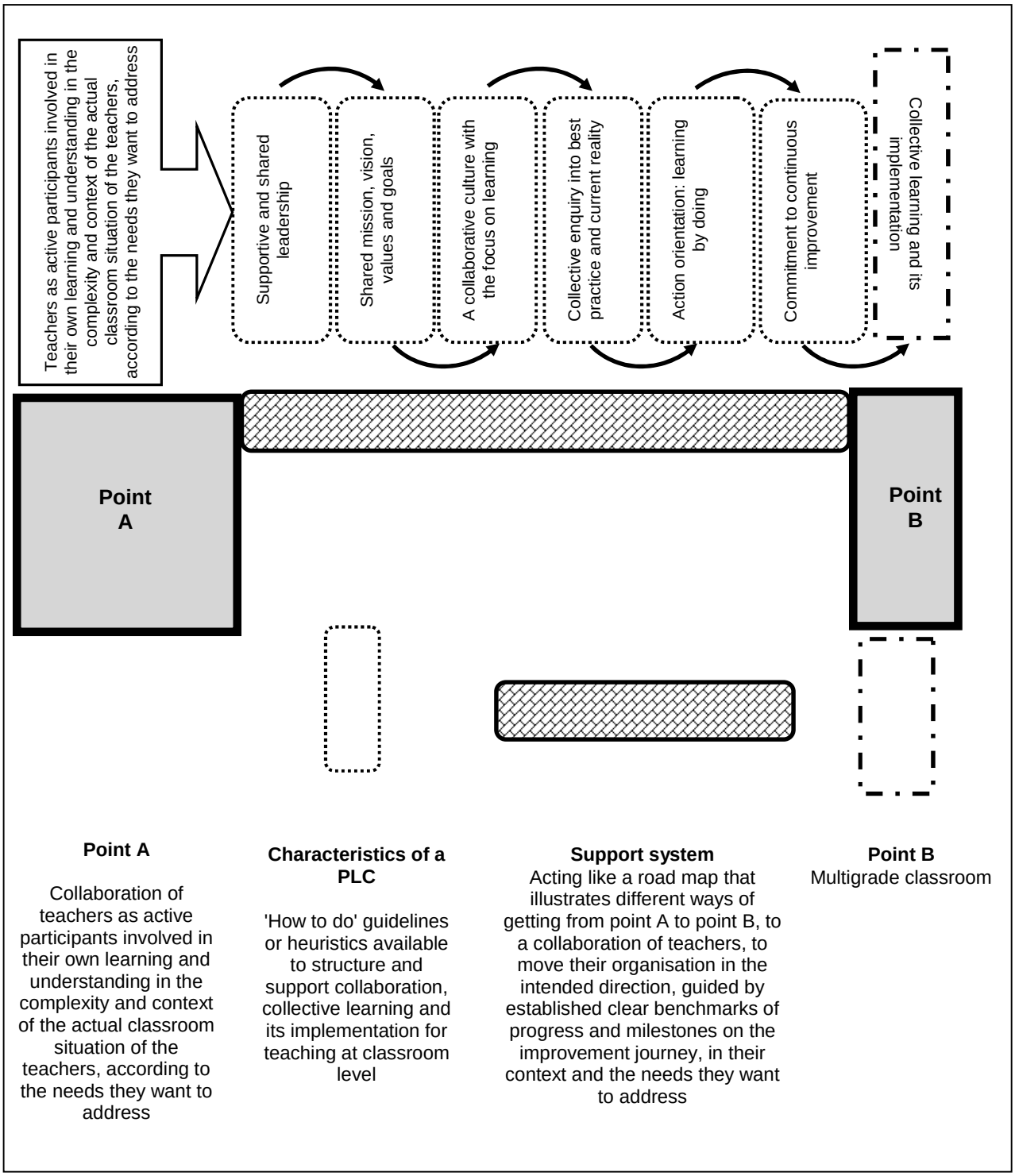


Figure 3.11: Support and guidance structure for teachers in multigrade schools in South Africa functioning as a Professional Learning Community (Adapted from Senge, 1990; DuFour & Eaker, 1998; The Annenberg Institute for School Reform, 2003)

According to reviewed literature (Section 3.3), the following characteristics of a PLC will ensure support for and guidance to a collaboration of teachers within their context and the needs they want to address (Figure 3.12):

- Characteristic 1: Supportive and shared leadership
  - ✓ Support and guidance indicator*:* Enhances shared leadership capacity in order to empower all members of a PLC to share in the vision and mission and to make effective decisions that positively affect learning and achievement (Section 3.3.1).
- Characteristic 2: Shared mission, vision, values and goals
  - ✓ Support and guidance indicator*:* Specifies what teachers will start doing today to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones on the improvement journey (Section 3.3.2).
- Characteristic 3: Collaborative culture with the focus on learning
  - ✓ Support and guidance indicator*:* Acts as a strategic vehicle for getting the work accomplished and for moving the organisation into the future (Section 3.3.3).
- Characteristic 4: Collective enquiry into best practice and current reality
  - ✓ Support and guidance indicator*:* Engages and supports the members of a PLC in collective enquiry into (1) best practices about teaching, (2) a candid clarification of their current practices, and (3) an honest assessment of the teachers' learning to move beyond discussions and to help them to focus on areas that can contribute to significant improvement (Section 3.3.4).
- Characteristic 5: Action orientation: learning by doing
  - ✓ Support and guidance indicator*:* Provides and serves as the 'fuel' for a PLC to take action in describing the behaviours that are required by an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation (Section 3.3.5).
- Characteristic 6: Commitment to continuous improvement
  - ✓ Support and guidance indicator*:* Analyses the impact of the changes and applies the new knowledge in the next cycle to enhance continuous improvement (Section 3.3.6).

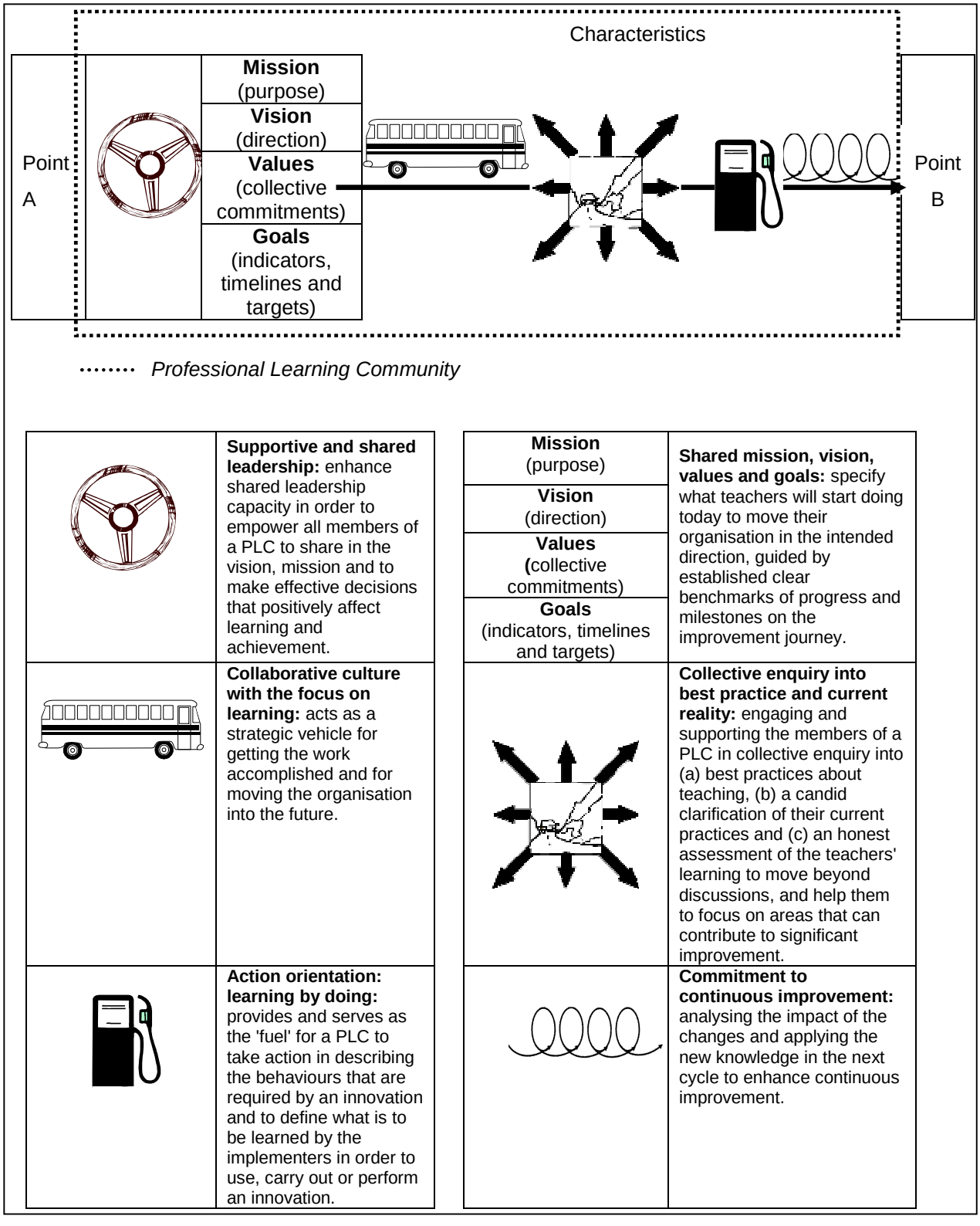


Figure 3.12: Characteristics of a PLC providing clear benchmarks of progress and milestones on the improvement journey (Adapted from The Annenberg Institute for School Reform, 2003; DuFour *et al.*, 2008; Hall & Hord, 2011)

In the conceptual framework, the input is depicted in terms of professional development in the form of training and resources. Training relates to the training on national, provincial and local level that has an impact on what teachers implement in their classrooms, namely an understanding of how they can organise, adapt and present certain aspects or subject matter for instruction in multigrade classrooms. The input into the system affects all the processes of implementation directly and indirectly.

In the conceptual framework, the process is depicted in terms of outcomes. The outcomes eventuate in terms of supporting the collaboration of multigrade teachers in the context of a multigrade education and the needs they want to address, creating, managing and sustaining a PLC through four key operational processes, and collective learning of what needs to be done (knowledge) to result in action or behaviour that is consistent with that knowledge in the actual classroom.

The immediate outcome of this research focuses on supporting and guiding the collaboration of multigrade teachers and principals in the context of multigrade classrooms and addressing their needs. In functioning as a PLC, according to the characteristics of a PLC, a support approach is envisaged (Sections 3.3.1 – 3.3.6) that supports the collaboration of teachers in the context of multigrade education and that addresses their needs. The conceptual framework focuses on two distant outcomes:

- creating, managing and sustaining a PLC through four key operational processes: optimising resources and structures, promoting individual and collective learning, explicit promotion and sustaining of an effective PLC, and leadership and management; and
- collective learning of what needs to be done (knowledge) to result in action or behaviour (implementation) that is consistent with that knowledge in the actual classroom.

3.5 Conclusion

The review of the literature allowed the researcher to examine professional learning communities with particular attention given to basic dimensions of effective professional learning communities as a way of supporting and guiding teachers to rethink their own practice, to construct new classroom models, roles and expectations, and to teach in ways they have never taught before.

Touted for its positive effects in supporting and guiding teachers with the opportunities to interact with one another, the PLC was described in the literature as a model committed to continuous support and guidance for all in order for them to move their organisation in the

intended direction, guided by established clear benchmarks of progress and milestones on their improvement journey. In effective professional learning communities, all stakeholders shared a solid foundation consisting of collaborative teams that worked inter-dependently to achieve common goals, based on a shared mission, vision, values and goals, and focused on results as evidence, achieved by a commitment to continuous improvement. In the next chapter, the methodology employed in this research is examined.

CHAPTER 4

OVERVIEW OF THE RESEARCH DESIGN

4.1 Introduction

How a researcher perceives the world, his/her knowledge and the research question, will influence what he/she will research and how it will be researched (Henning *et al.*, 2004:31). Chapter 4 introduces how the research question and research sub-questions will be researched. This chapter introduces the research paradigm (Section 4.2) and educational design research (Section 4.3), as a research approach suitable to address complex and 'wicked' problems in educational practice for which no clear guidelines or solutions are available. Section 4.4 introduces the reasons why educational design research is suitable for addressing the problems for multigrade education in South Africa and how design research is applied for this research. Section 4.5 introduces the role of the researcher. Section 4.6 discusses the ethical considerations for this research.

4.2 Research paradigm

The purpose of this research is not to prove what the problems are but to identify the problems and to see how the current situation in multigrade education in South Africa can be improved. Stating a knowledge claim means that researchers start a project with certain assumptions about how they will learn and what they will learn during their enquiry. These assumptions can be grounded in one of four schools of thought about knowledge claims (Table 4.1), each governed by unique claims about what warrants knowledge.

Table 4.1: Four schools of thought about knowledge claims (Creswell, 2003:6)

Postpositivism	**Constructivism**
• Determination • Reductionism • Empirical observation and measurement • Theory verification	• Understanding • Multiple participant meanings • Social and historical construction • Theory generation
Advocacy/Participatory	**Pragmatism**
• Political • Empowerment issue-oriented • Collaborative • Change-oriented	• Consequences of actions • Problem-centred • Pluralistic • Real-world practice oriented

In focusing on the problems and to investigate how the current situation in multigrade education in South Africa can be improved, educational design research was applied for this research as the most appropriate to address the research question. Design research is recommended in educational settings when conditions operate to make the problem more

'wicked' (problems that also engage elements that make their solution frustrating or potentially unattainable), and open, rather than simple and closed, for example:

- "when the content knowledge to be learned is new or being discovered even by the experts;
- when how to teach the content is unclear: pedagogical content knowledge is poor;
- when the instructional materials are poor or not available;
- when the teachers' knowledge and skills are unsatisfactory;
- when the educational researchers' knowledge of the content and instructional strategies or instructional materials are poor; and
- when complex societal, policy or political factors may negatively affect progress" (Kelly, 2009:75-76).

The design research process in this research was located in the pragmatist paradigm. Pragmatists see the problem as the most important starting point for their design research. They use pluralistic approaches to derive knowledge about the problem, implying that they often use a mixed-method approach. Their knowledge claims arise out of actions, situations and consequences during the applications of what works to solve the problem. This means that the 'how' they will learn and 'what' they will learn during their enquiry will arise out of actions, situations and consequences during the application of what works to solve the problem (Creswell, 2003:11).

The idea of pragmatism comes from the works of Peirce (1905) and James (1981). Assumptions identified in these works hold that:

- knowledge claims arise out of actions, situations and consequences rather than antecedent conditions;
- there is a concern with applications – 'what works' and solutions to problems;
- the problem is most important and researchers use all approaches to understand the problem;
- truth is what works at the time; it is not based on a strict dualism between the mind and a reality completely independent of the mind;
- pragmatists agree that research always occurs in social, historical, political and other contexts;
- pragmatists do not see the world as an absolute unity; and

- individual researchers have a freedom of choice. They are 'free' to choose the methods, techniques and procedures of research that best meet their needs and purpose (Creswell, 2003:11-12).

The pragmatism approach allows for research on what people experience in context or *in situ* and how they experience what they experience; pragmatism also observes how people behave when absorbed in genuine life experiences in a real-world setting (Creswell, 2003).

The significance of a knowledge claim, located in the pragmatism school of thought about knowledge claims, is that it addresses:

- the complex problems of multigrade education in South Africa;
- the recommendations of the baseline report on multigrade education in South Africa, (Centre for Multigrade Education, 2009); and
- the argument of Plomp (2009:9) for a research approach suited to addressing practical problems.

In the baseline report on multigrade education in South Africa, the Centre for Multigrade Education (2009:55) places special emphasis on the importance of a kind of research that will provide opportunities to address as many levels as possible, and involve many partners. It is envisaged that this should result in successful interventions contributing to the professional development of all participants involved in multigrade education, thereby expanding and strengthening the knowledge base and co-operative spirit and motivation.

Plomp (2009:9) argues that there is a need for a research approach that addresses complex problems in educational practice. The Design-Based Research Collective (2003:5) supports Plomp's argument by arguing that educational research is often divorced from the problems and issues of everyday practice and that there is a need for new research approaches that speak directly to problems of practice that lead to the development of 'usable knowledge'.

For this research the pragmatism school of thought about knowledge claims opened the door to multiple methods (one of the characteristics of pragmatism), and different assumptions, as well as to different forms of data collection and analysis that allow for knowledge claims that:

- arise out of actions, situations and consequences; and
- are based on what works at the time and what offers solutions to the specific problems of multigrade teachers in South Africa.

4.3 Research design

4.3.1 Design research

Educational design research is the systematic study of designing, developing and evaluating of educational interventions which aim at advancing our knowledge about the characteristics (Table 4.2) of these interventions, and the processes of designing and developing them (Plomp, 2009:9).

Table 4.2: Characteristics of educational design research (Adapted from Van den Akker, Gravemeijer, McKenney and Nieveen, 2006:5)

Characteristics of educational design research
• **Interventionist**: aims to design an intervention in a real world setting. • **Iterative**: incorporates cycles of analysis, design and development, evaluation and revision. • **Involvement of practitioners**: involves the participation of practitioners in the various stages and activities of the research. • **Process oriented**: focuses on understanding and improving interventions. • **Utility oriented**: measures the merit of a design, in part by its practicality for users in real contexts. • **Theory oriented**: bases research upon a conceptual framework and theoretical propositions, while the systematic evaluation of consecutive prototypes of the intervention contributes to theory building.

Design research projects strive after two types of main results (Nieveen, 2009:89). The first main aim comprises high-quality interventions (such as programmes, products and processes) designed to solve complex educational problems, and the second main aim of design research is the accompanying set of well-articulated design principles that provides insight into the:

- purpose/function of the intervention;
- key characteristics of the intervention (substantive emphasis);
- guidelines for designing the intervention (procedural emphasis);
- implementation conditions; and
- theoretical and empirical arguments (proof) for the characteristics and procedural guidelines (Nieveen, 2009:89).

To achieve these results, design research comprises a number of stages or phases:

1. Preliminary phase: including needs and content analysis, review of literature and development of a conceptual or theoretical framework for a study.

2. Prototyping phase: iterative design phase consisting of iterations – each being a micro-cycle of research aimed at improving and refining the intervention.

3. Assessment phase: semi-summative evaluation to conclude whether the solution or intervention meets the pre-determined specifications and often results in recommendations for improvement of the intervention (Plomp, 2009:15).

Furthermore, the design and development activities in the phases must be conducted in collaboration and not just for professionals from educational practice (McKenney, Nieveen & Van den Akker, 2006:77). Therefore, a high emphasis is placed on the involvement of (Table 4.2) and collaboration with practitioners and the target group. Involvement of the target group may lead to positive effects in the development process in their target context, because it provides for:

- more accurate information about the task, and in a specific context, which requires support;
- more intensive discussion about the requirements and support to address the specific needs;
- better structured and more opportunities to negotiate and justify design ideas;
- increased user commitment, ownership and willingness to apply the final product in their teaching; and
- professional growth and involvement of the participants (Nieveen, 2009:98).

4.3.2 Design research approach

The design research approach (Figure 4.1) encompasses educational design processes and is therefore cyclical in character: analysis, design, evaluation and revision activities are iterated until a satisfying balance between ideals ('the intended') and realisation has been achieved (Plomp, 2009:13).

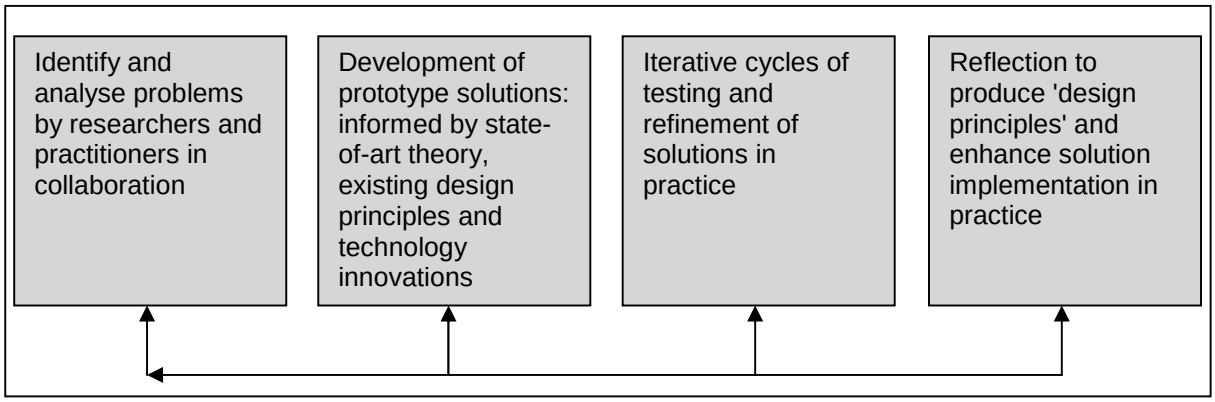


Figure 4.1: Design research approach according to Reeves (2006) (Plomp, 2009:14)

McKenney (2001: xii) in her study, illustrates the cyclical process as follows (Figure 4.2):

- Each cyclical process also encompasses a series of specific activities (Figure 4.3).
- The design and development activity evaluation data from the previous cycles inform planning and design of the next prototype.
- The implementation/try-out activity tests the new prototype or the presentation of planned changes, or a mock prototype can be evaluated by users and experts.
- The evaluation activity encompasses judgement by experts and users of the new prototype. Their feedback provides a basis for further development and improvement.

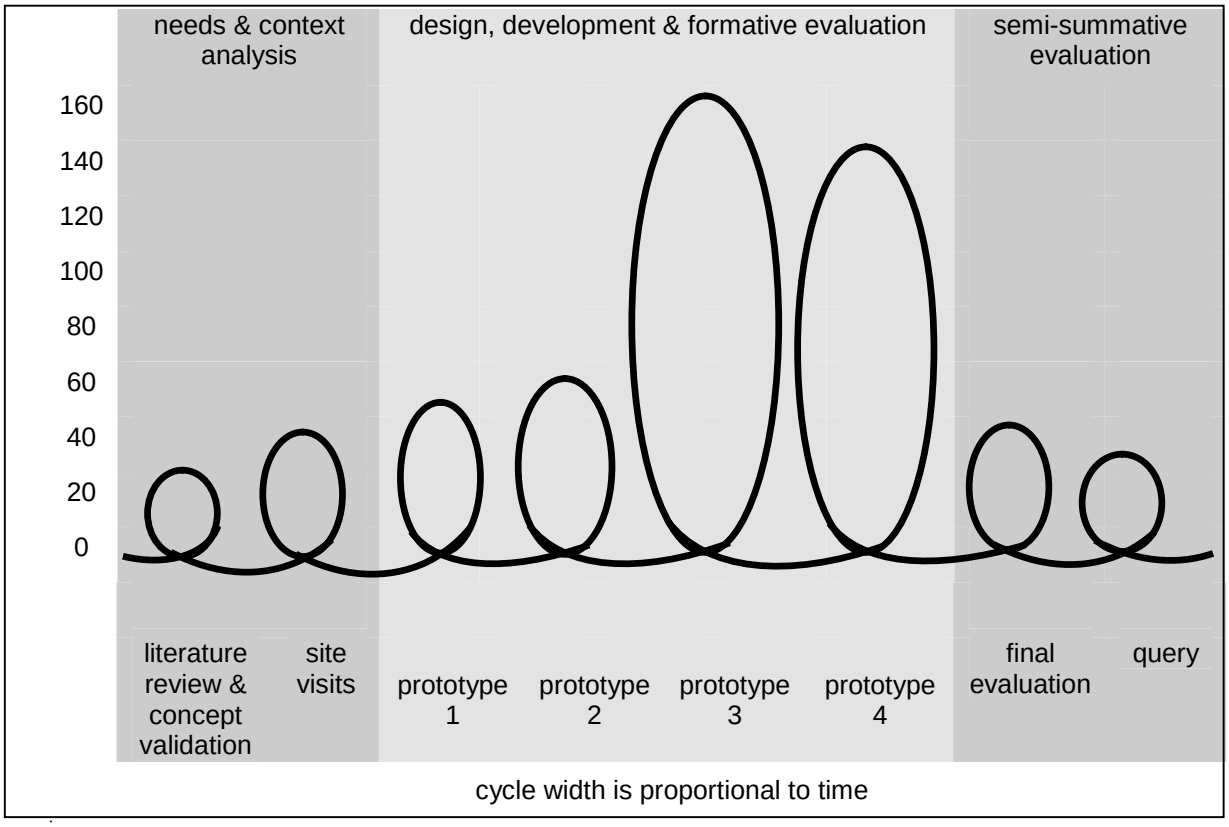


Figure 4.2: Display of the CASCADE-SEA study (McKenny, 2001)

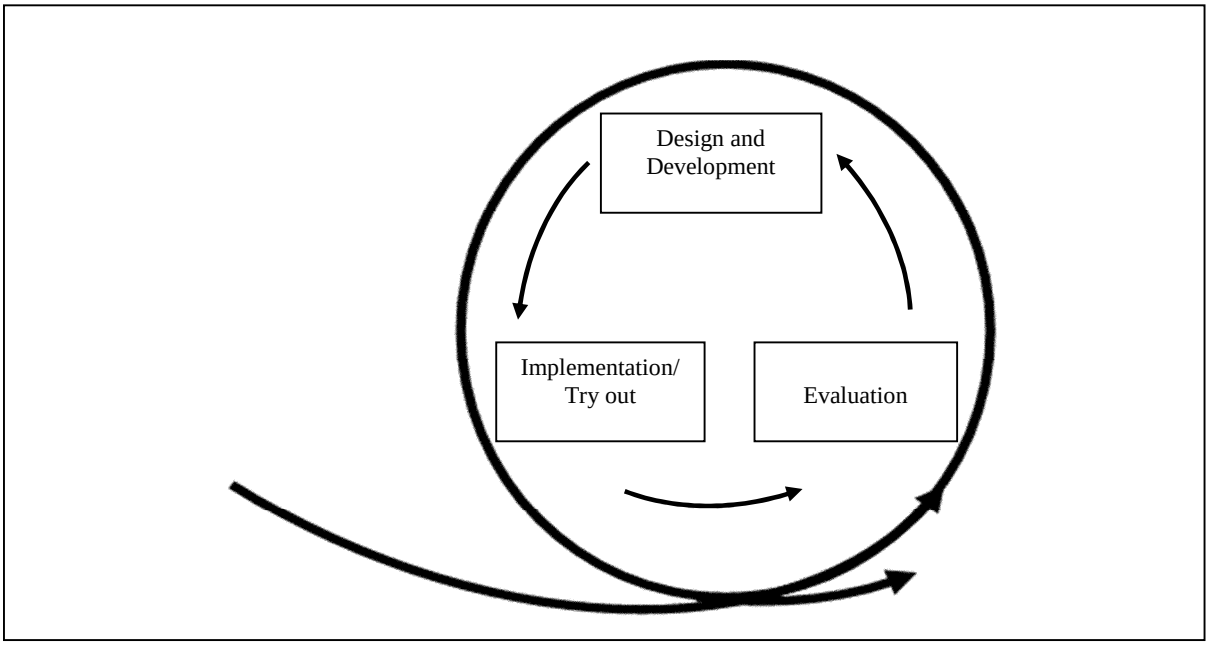


Figure 4.3: Cyclical process (Adapted from Plomp, 2009:19)

The evaluation (in the meaning of the systematic assessment of the worth or merit of an object) of each cyclical process is a crucial feature because empirical data are needed to gain insight into the quality of the intervention and design principles (The Joint Committee on Standards for Educational Evaluation, 1994). The function of formative evaluation is 'to improve'. In order to achieve the aims and objectives of this research, formative evaluation was applied in order to uncover shortcomings of an object during its development process with the purpose of generating suggestions for improving it (Plomp, 2009:19).

4.3.3 Evaluative criteria in design research

Nieveen (Nieveen, 2009:92) argues that formative evaluation provides insight into the potentials of the intervention and its key characteristics, and the results of the formative evaluation give scope for:

- improving the prototype of the intervention towards a high-quality final deliverable; and
- sharpening the underlying tentative design principles towards an elaborated set of design principles.

Nieveen (2009:26, 93-94) proposes four generic criteria for high quality interventions that are applicable to a wide array of educational interventions: relevance (content validity), consistency (construct validity), practicality and effectiveness (Table 4.3).

The significance of these criteria for research is:

- If the components of the intervention are based on state-of-the-art knowledge and all components of the intervention are consistently linked to one another, the intervention is considered to be valid.
- If the components of the intervention are usable in the settings for which it has been designed and developed, the intervention is considered to be practicable.
- If using the components of the intervention result in desired outcomes, the intervention is considered to be effective.

Table 4.3: Criteria for high quality interventions (Adapted from Plomp, 2009:26, 29)

Criterion	Description
Relevance (also referred to as **content validity**)	The need (relevance) for the intervention and that the components of the intervention should be based on state-of-the-art knowledge (content validity) and all components should be consistently linked to one another (construct validity).
Consistency (also referred to as **construct validity**)	The intervention is 'logically' designed and all components should be consistently linked to one another (construct validity).
Practicality	The meeting of conditions, in the realistic settings for which it has been designed and developed. **Expected**: The characteristics of a PLC are expected to be usable in the settings for which it has been designed and developed. **Actual**: The characteristics of a PLC are usable in the settings for which it has been designed and developed.
Effectiveness	The extent that the experiences and outcomes of the intervention are consistent with the intended aims. **Expected**: Using the characteristics of a PLC is expected to result in desired outcomes. **Actual**: Using the characteristics of a PLC result in desired outcomes.

As the design progresses from the Preliminary Phase through the Prototyping Phase into the final Assessment Phase, the evaluative emphasis of the criteria differ per phase (Figure 4.4). Each iteration concentrates usually on one or two of these criteria (Table 4.3), but at the end of a design research project, the intervention should suffice for all these criteria (Plomp & Nieveen, 2009:26, 93-94).

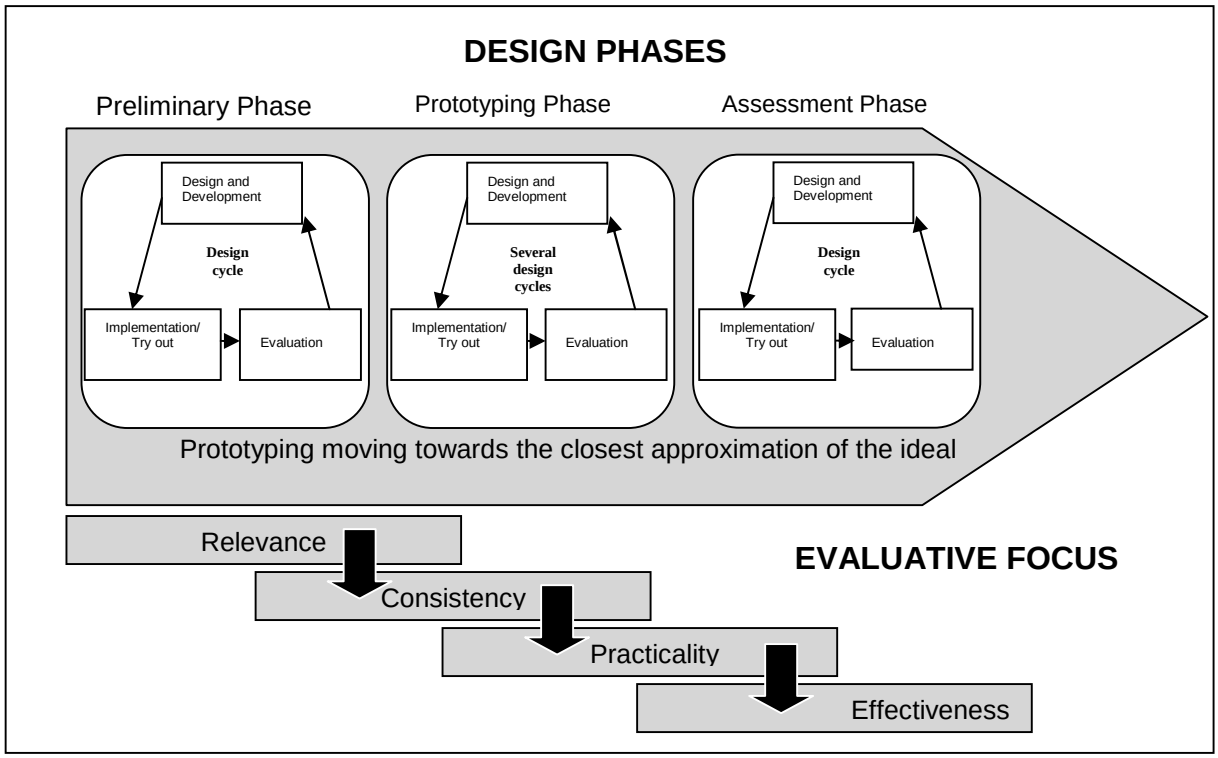


Figure 4.4: Interaction between design phase, design activities and evaluative focus in Design Research (Adapted from Archer, 2010:104)

During the preliminary research, where the emphasis is on analysing the problem and reviewing the literature, the criteria of relevance (content validity) and consistency (construct validity) (Table 4.4) are the most dominant (Nieveen, 2009:94). This is to ensure that the intervention indeed addresses a need, its design is based on state-of-the-art (scientific) knowledge, and that the intervention is 'logically' designed. At this stage not much attention is yet given to practicality and effectiveness.

Table 4.4: Criteria differ per phase (Adapted from Nieveen, 2009:96)

Design stages →		***Design specifications*** (General description on the intervention.)	***Global design*** (First elaboration of the intervention, in which some or all of the components were given form.)		***Partly detailed intervention*** (A portion of the intervention had been elaborated to a concrete level and could be used by the target group.)	***Complete intervention*** (The total intervention had been detailed and could be used in practice.)
Quality criterion ↓		*Preliminary Phase* (Phase 1)	*Prototyping Phase* (Phase 2)			*Assessment Phase*
			Cycle 1	**Cycle 2**	**Cycle 3**	
Relevance (Content validity)		•				
Consistency (Construct validity)		•				
Practicality	expected		•	•		
	actual				•	
Effectiveness	expected		•	•	•	
	actual					

In the beginning of the prototyping stage considerable attention has to be paid in the formative evaluation, to the criterion of practicality, whilst effectiveness will become increasingly important in later iterations (Plomp, 2009:27). Practicality refers to the usability of the intervention in the settings for which it has been designed and developed, and effectiveness refers to using the intervention consistent with the intended aims (Plomp, 2009:26). This is to ensure that the intervention is usable (practicality) in the settings for which it has been designed and developed, and that using the intervention results (effectiveness) in desired outcomes (Table 4.3).

Nieveen (2009:94) emphasises the importance for the researcher, during the prototyping stage, of distinguishing between expected and actual practicality and effectiveness. Only when the participants (teachers) have had practical experience with using the intervention, the researcher will be able to get data on the actual practicality of the prototype, and only when target participants have had the opportunity to use the intervention in the target setting, will the researcher be able to get data on the actual effectiveness.

In a design research project, formative evaluation has various layers (Figure 4.5). In the early stages of a project, the evaluation can be more informal in the form of self-evaluation, one-to-

one evaluation, or an expert review, and to small-group evaluation aimed at testing the practicality and effectiveness to a full field test in a later stage (Plomp, 2009:27-28).

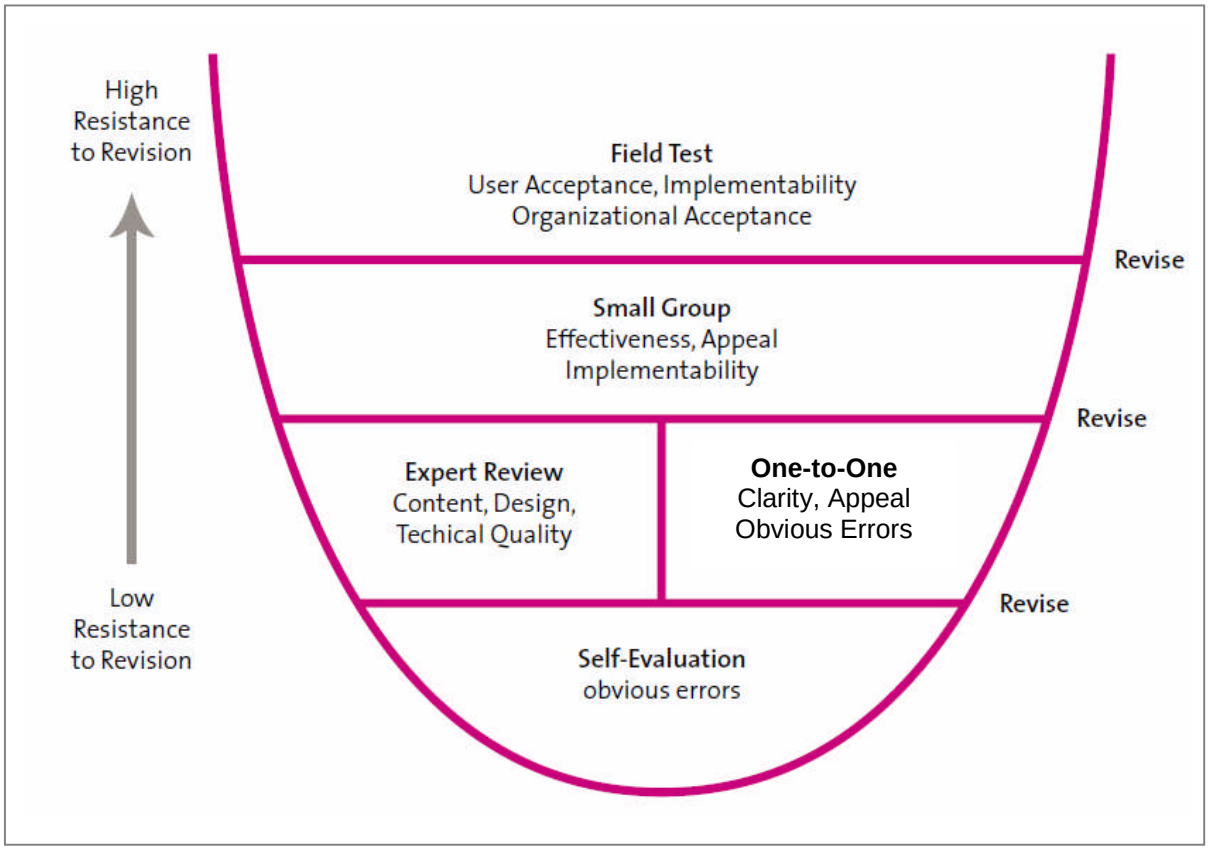


Figure 4.5: Layers of formative evaluation (taken from Tessmer, 1993)

Design researchers should choose for each phase and for each prototype formative evaluation approaches that are suitable for the purpose of that particular stage of the research (Nieveen, 2009:95). Nieveen (2009:95-96) distinguishes between different evaluation approaches and within each approach various evaluation activities (Table 4.5) that can be used.

Table 4.5: Specific formative evaluation approaches and activities (Adapted from Nieveen, 2009:95-96)

Evaluation approach	Evaluation activities
Screening Checking the design with some checklists on important characteristics of components of the prototypical intervention.	Using checklists.
Expert appraisal Group of experts in a specific field or area reacts on a prototype of an intervention.	Interviewing and administering questionnaires.
Walkthrough Design researcher and one or a few representatives of the target group together go through the set-up of the intervention.	Using checklists, interviewing and observation.
Micro-evaluation A small group of target users uses parts of the intervention outside its normal user setting.	Observation, requesting logbooks, learning reports, administering questionnaires, reviewing documents, interviewing.
Try-out or field testing Limited number of the user group (e.g. teachers and learners) uses the materials in the day-to-day user setting.	Observation, requesting logbooks, learning reports, administering questionnaires, reviewing documents, interviewing.

In the early stages of the intervention, screening, expert appraisal and a walkthrough are used as an evaluation approach, with checklists, interviewing, administering questionnaires and observation as evaluation activities (Table 4.6) to obtain data. In the later stages of the intervention, micro-evaluation, a try-out or field testing are used as an evaluation approach, with observation, logbooks, learning reports, administering questionnaires, reviewing documents and interviewing as evaluation activities, to obtain data (Nieveen, 2009:95-96).

Table 4.6: Table for selecting formative evaluation methods and activities (Adapted from Nieveen, 2009:96)

Design stages → ↓ **Quality criteria**		***Design specifications***	***Global design***	***Partly detailed intervention***	***Complete intervention***
Relevance (Content validity)		Screening Expert appraisal	Screening Expert appraisal	Screening Expert appraisal	Screening Expert appraisal
Consistency (Construct validity)		Screening Expert appraisal	Screening Expert appraisal	Screening Expert appraisal	Screening Expert appraisal
Practicality	expected	Screening Expert appraisal	Expert appraisal Walkthrough	Expert appraisal Walkthrough	Expert appraisal Walkthrough
	actual			Micro-evaluation	Micro-evaluation Try-out
Effectiveness	expected	Screening Focus group	Screening Focus group	Expert appraisal	Expert appraisal
	actual			Micro-evaluation	Micro-evaluation Try-out

The development of the prototypes during the evolutionary prototyping process in this research focused on 'to improve' and uncover the shortcomings of a support system for multigrade teachers and principals in South Africa during its development process, with the purpose of generating suggestions for improvement. In order to improve and to uncover the shortcomings of a support system during the evolutionary prototyping process, empirical data were needed to gain insight into the quality of the tentative intervention and design principles and to continually refine and evolve each prototype towards a final deliverable. To obtain empirical data, a formative evaluation, and not a summative evaluation of the prototype was considered to be applicable to this research.

It is often too demanding to expect of professional developers that are (usually) not professional researchers and have only limited resources, to perform full-scale evaluations with strict research criteria, large numbers of respondents and large amounts of data (Nieveen, 1997:70). Therefore, this research aims at the use of efficient small-scale evaluation approaches, which do not necessarily need ample time and resources. Across the Preliminary and Prototyping Phases, different approaches (strategies and activities) were used as evaluation methods (Table 4.6) – as discussed during the development of each prototype. Each approach is especially suited to finding answers for the main or sub-research questions.

In this section the relevance of educational design research, as the systematic study of designing, developing and evaluating educational interventions which aim at advancing our knowledge about the characteristics of these interventions and the processes to design and develop them, is discussed. When design research is conducted within the framework of a programme of research, addressing fundamental problems in educational practice for which no or only a few validated principles are available will result in a specific body of knowledge, *viz*., substantive and procedural design principles that may contribute to improve education (Plomp, 2009:13, 33). In Section 4.4, the framework of the programme of research for this research, addressing the problem in multigrade schools in South Africa, is discussed.

4.4 Application of educational design research to execute this research

Section 4.3 introduced design research as an appropriate research design. Section 4.4 elaborates on how design research is applied to this research, addressing a problem in multigrade education in South Africa for which no clear guidelines for solutions are available. It explains the conditions that make the problem of multigrade education in South Africa more 'wicked' and open, than simple and closed, and why design research can be seen as the most appropriate design to address the research question. It also introduces the rationale for

an evolutionary prototyping approach in this research in Phases 1 and 2 to continually refine and evolve a prototype towards a final deliverable.

4.4.1 Reason for using educational design research for this research

In order to achieve the aims and objectives of this research, educational design research was applied as the most appropriate design to address the research question. Based on Kelly's (2009:76) conditions (Section 4.2), more specifically the reasons for using educational design research to execute this research are to:

- address a 'wicked' problem of multigrade education in South Africa (discussed in Chapter 2) – a problem that shares the features of an open problem but that also engages elements that make the solution frustrating or potentially unattainable. In this research the 'wicked' problem was created by the following conditions:
  - content knowledge to be learned for multigrade schools in South Africa is new or being discovered by the experts;
  - multigrade pedagogical content knowledge in the context of South African schools is poor and how to teach it is unclear;
  - instructional materials for multigrade education in South Africa are not available;
  - teachers' knowledge of and skills to cope with multigrade education are unsatisfactory; and
  - educational researchers' knowledge of the content, instructional strategies and instructional materials for multigrade education in South Africa is poor (Boonzaaier, 2008: 343-345, 350-356);
- provide, by grounding itself in the needs, constraints and interactions of local and naturalistic settings practice, a lens for understanding how theoretical claims about teaching and learning can be transformed into effective learning in educational settings;
- focus on deep learning of the content and processes by challenging multigrade teachers and principals at their level of competence and helping them to construct their own meaning from current experiences using previous knowledge;
- allow for collaboration, with shared goals, between the researcher and the PLC, working together to produce meaningful changes in contexts of practice in a complex system and to refine generative and predictive theories of learning (Gravemeijer & Van Eerde, 2009:512);

- allow the researcher to condense the experience of the participants to a central meaning, to enter the subject's 'life world' or 'life setting' and to place himself in their shoes;
- allow the investigation of the reality to be transformed by attending to issues directly experienced and explicitly recognised as problems by the participants in their day-to-day working environment;
- search for new and innovative solutions to problems, while also seeking findings that are transferable, practicable and socially responsible (De Villiers, 2005:114);
- support collective reflection by including all of the participants in the process of planning, acting, observing and reflecting to achieve change within their unique contexts and backgrounds assigned to them (Plomp, 2009:13, 15, 22); and
- allow for the educational design research process that is located in a pragmatic paradigm (Table 4.1) of the schools of knowledge claims, aimed to understand the phenomena through the meaning that participants assigned to them (Henning *et al.*, 2004:21).

4.4.2 Research procedures

The aim of this research was not to conduct a full field test but to:

- identify and analyse problems by researchers and practitioners in collaboration in multigrade education;
- develop prototype solutions, informed by state-of-art theory, existing design principles and technology innovations;
- test and refine solutions in practice with the help of iterative cycles; and
- produce 'design principles' and enhance solution implementation in practice through reflection.

To develop solutions for this research a prototyping approach was employed towards a final deliverable. The results of the evaluation of each prototype were used in the development of the next prototype. Nieveen (2009:90) refers to this refining process as evolutionary prototyping. The significance of employing an evolutionary prototyping approach for this research, based on formative evaluation results and reflections of developers on the prototype, was that it allowed for:

- a good quality intervention;
- collaboration, with shared goals, between the researcher and the PLC;

- the researcher to obtain more accurate information about the task, and in a specific context, which requires support;
- a more intensive discussion about the requirements and support to address the specific needs;
- the researcher to reduce the experience of the multigrade teachers to a central meaning and to enter the subjects' 'life world' or 'life setting' of the multigrade education and to place himself in their shoes;
- investigating reality to transform in teachers' day-to-day working environment;
- the search for new and innovative solutions for problems, while also seeking findings that are transferable, practicable and socially responsible;
- a cyclical process, encompassing a series of specific activities and for the evaluation data from the previous cycles to inform planning and design of the next prototype; and
- collective reflection by including all the multigrade teachers in the process of planning, acting, observing and reflecting to achieve change of their unique multigrade contexts and classrooms assigned to them.

Figure 4.6 details the design and evaluation interactions for this research. The development of four prototypes, Prototypes 1 – 4, was needed during the evolutionary prototyping process in this research to develop solutions for a support system prototype to support and guide multigrade teachers and principals in multigrade schools in South Africa. Prototype 1, developed during Phase 1 (Preliminary Phase), focused on generating and identifying design guidelines and specifications of a support system, as a first draft for this research.

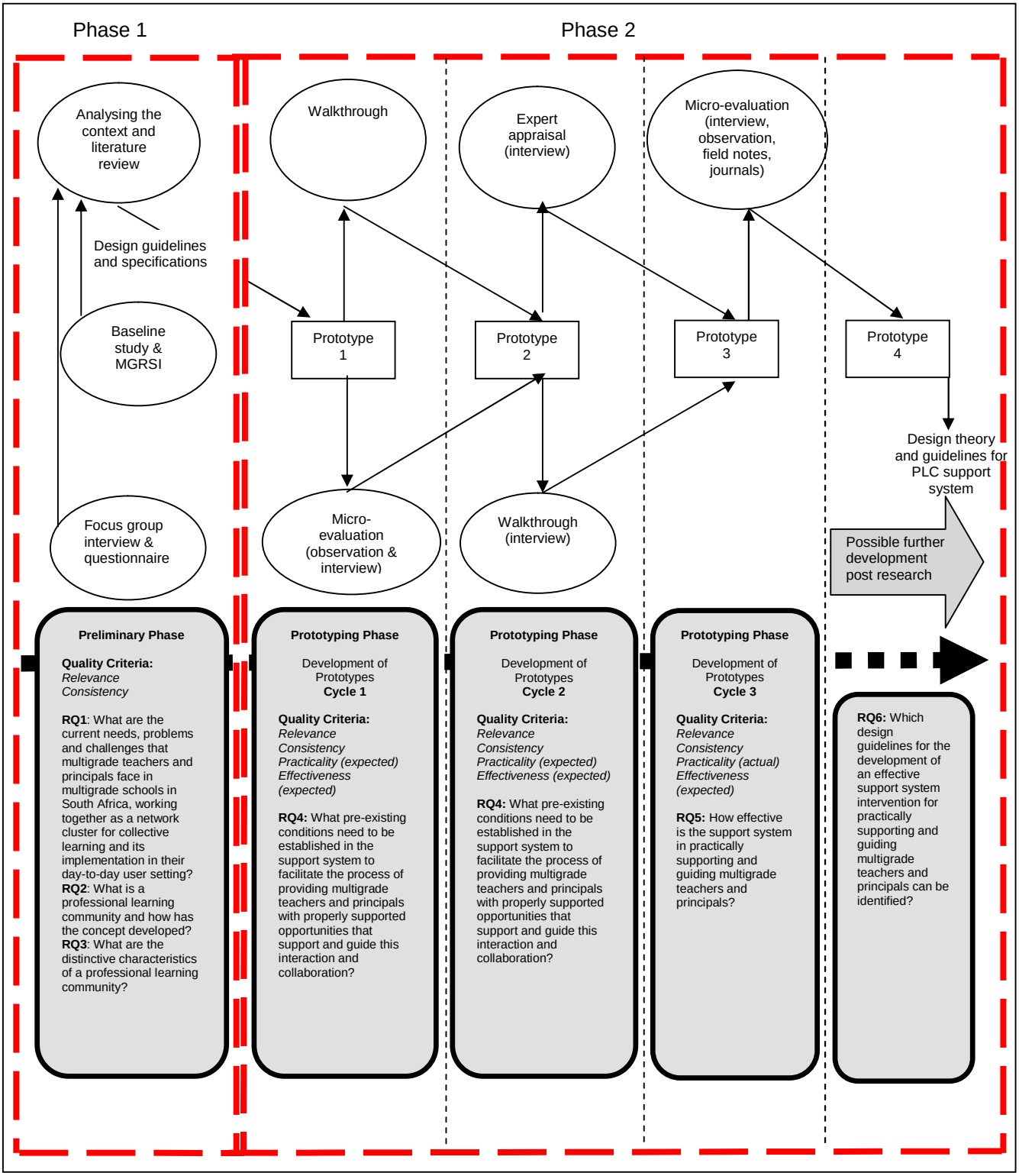


Figure 4.6: Design research process followed

The Prototyping Phase comprised three cycles and focused during the evolutionary prototyping process on elaborating the components of the possible support system for multigrade teachers and principals in multigrade schools to a concrete level and ironing out implementation problems before use in their day-to-day user setting. In each Cycle a prototype was developed:

- Prototype 2, developed during Phase 2: Cycle 1 (Prototyping Phase), focused on determining the pre-existing conditions needing to be established in the support system, and on elaborating and adapting the design guidelines and specifications of Prototype 1 to a concrete level for multigrade teachers for use outside their day-to-day user setting.
- Prototype 3, developed during Phase 2: Cycle 2 (Prototyping Phase), focused on determining the pre-existing conditions needing to be established in the support system, and on appraising the expected practicality for multigrade teachers and principals to use Prototype 2 in their day-to-day user setting.
- Prototype 4, developed during Phase 2: Cycle 3 (Prototyping Phase), focused on assessing the actual practicality for multigrade teachers and principals to use Prototype 3 in their day-to-day user setting and identifying the design guidelines for the development of an effective support system intervention for practically supporting and guiding multigrade teachers and principals.

In the following paragraphs the development of each prototype for this research will be discussed to explain:

- what the researcher aimed to achieve;
- the specific criteria that were addressed in the development of each prototype; and
- which data collection methods and activities the researcher used to answer each research question.

Prototype 1 – developed during Phase 1 (Preliminary Phase)

Prototype 1 was developed during Phase 1 (Preliminary Phase) and focused on generating and identifying design guidelines and specifications for a support system, as a first draft, for multigrade teachers and principals in multigrade schools in South Africa. This prototype was needed because, although multigrade teachers in the baseline study did recognise the advantages of working together, network clustering was experienced as problematic for them because they came together as cluster groups but were unclear about how they could support one another.

Prototype 1 builds on the body of knowledge of:

- pre-existing literature and a research review of a PLC;
- the MGRSI;
- the case study (Boonzaaier, 2008) which revealed the successes and the challenges of the MGRSI, focusing on the needs of multigrade schools and ways to address those needs, implemented from 2001 to 2006;
- the baseline study on multigrade education in South Africa; and
- a focus group interview and questionnaire with seven principals of rural multigrade schools. Seven multigrade teachers and principals with experience of multigrade education and of being principals of multigrade schools (part of a project to develop the leadership of multigrade principals for a year at the CMGE) were asked to function as a group to construct a manual for multigrade principals in South Africa. It was the multigrade teachers' and principals' first experience of functioning as a PLC and the CMGE saw in this project the additional opportunity to identify and establish conditions supporting and guiding multigrade teachers and principals in multigrade schools, functioning as a PLC.

The sample of principals, with experience of multigrade education and (Table 4.7) of being principals of multigrade schools, came from a:

- two-person staffed multigrade school;
- three-person staffed multigrade school;
- four-person staffed multigrade school; and
- five-person staffed multigrade school,

in the Overberg Education District (two), West Coast Education District (three) and the Winelands Education District (two) (Table 4.8).

Table 4.7: Years of multigrade education experience of the participants from the seven multigrade schools

No.	Multigrade school	Age of participant	Total years of teaching experience	Total years of experience in monograde teaching	Total years of experience in multigrade education	Total years of experience as a principal of a multigrade school
1	Participant 1	53	25	2	23	7
2	Participant 2	44	18	15	3	3
3	Participant 3	43	20	0	20	18
4	Participant 4	45	18	10	8	6
5	Participant 5	53	25	14	11	3
6	Participant 6	47	25	13	12	12
7	Participant 7	46	23	5	18	18

Table 4.8: Participants from seven multigrade schools

No.	Multigrade school	Grades	Number of teachers (including the principal)	Nearest town	Education district
1	Participant 1 (School 1)	R – 7	4	Piketberg	West Coast Education District
2	Participant 2 (School 2)	R – 6	4	Citrusdal	West Coast Education District
3	Participant 3 (School 3)	1 - 6	2	Hopefield	West Coast Education District
4	Participant 4 (School 4)	R – 7	5	Wellington	Cape Winelands Education District
5	Participant 5 (School 5)	R – 6	5	Wolseley	Cape Winelands Education District
6	Participant 6 (School 6)	R – 7	5	Grabouw	Overberg Education District
7	Participant 7 (School 7)	R - 6	3	Ceres	Overberg Education District

Two generic criteria (Table 4.3) were used to guide the critical review of literature and a context analysis in generating ideas for the first draft. The relevance criterion was used to focus on the need for this intervention and on the state-of-the-art knowledge of a PLC. The consistency criterion was used to focus on all the characteristics that should be consistently linked to each other in a PLC in order to construct first drafts of the design guidelines.

During the process of the development and evaluation of Prototype 1, the ideas were generated from different strategies and activities (Table 4.9) as evaluation methods:

- data from a critical review of literature;
- quantitative and qualitative data – a baseline study conducted by the CMGE in the nine provinces in South Africa: Limpopo, Mpumalanga, North-West, Gauteng, Free State, KwaZulu-Natal, Eastern Cape, Northern Cape and Western Cape.

Thirty schools were involved in the study, while 101 schools responded to the baseline questionnaire and 21 principals and 14 officials were interviewed; and

- quantitative and qualitative data – questionnaire and a focus group interview with seven principals of rural multigrade schools that are part of a project at the CMGE. The well-researched instrument, The Professional Learning Community Assessment instrument (PLC A) (Huffman & Hipp, 2003:70-73), used by teachers as an assessment tool to support and enhance the development of professional learning communities and to contribute to continuous learning and school improvement, was used as a checklist during the screening process for this research. This also constituted the group that had to work for a year as a PLC to construct a manual for multigrade principals.

Table 4.9: Activity overview

Phase 1	**Cycle**	**Activities**										
Preliminary research	Prototype 1	Needs analysis∗, context analysis∗, literature review, questionnaire and focus group interview										
Phase 2	**Cycle**	**Strategy**					**Activities**					
		DS	**EA**	**WT**	**ME**	**TO**	**C**	**I**	**O**	**Q**	**J**	**F**
Prototyping Phase	Cycle 1 Prototype 2											
	Cycle 2 Prototype 3											
	Cycle 3 Prototype 4											

Legend = Strategies used = Activities used

∗ = Carried out completely or in part by someone other than the primary researcher/developer
Strategies: DS = developer screening; EA = expert appraisal; WT = walkthrough; ME = micro-evaluation; TO = Try-out
Activities: C = checklist; I = interviewing; O = observation; Q = questionnaire; J = journal; F =field notes

Prototype 2 – developed during Phase 2: Cycle 1 (Prototyping Phase)

Prototype 2 was developed during Phase 2 in Cycle 1 (Prototyping Phase) and focused on elaborating and adapting the design guidelines and specifications of Prototype 1 to a concrete level for multigrade teachers for use outside their day-to-day user-setting.

Prototype 2 was developed by the same seven principals (Table 4.7 and Table 4.8) involved in developing Prototype 1. As part of a project at the CMGE, they had to function as a group to construct a manual for multigrade principals. It was their first experience of functioning as a PLC and therefore they needed to elaborate and adapt the generic parts or components of a PLC (Prototype 1) to a concrete level for their specific requirements.

Three generic criteria (Table 4.3) were used to guide the process of elaborating and adapting the components of Prototype 1 to a concrete level for use outside their day-to-day user setting:

- Relevance (content validity): The components of the support system are based on state-of-the-art knowledge and all components of the support system are consistently linked to one another in order to provide support and guidance to multigrade teachers and principals.
- Consistency (construct validity): The intervention is 'logically' designed and all components should be consistently linked to one another. The characteristics of a PLC should act as clear benchmarks of progress and milestones for the multigrade teachers and principals to interact with each other in order to move their PLC in the intended direction of their improvement journey.
- Expected practicality: The characteristics of the support system are expected to be usable in the settings for which they are designed and developed. Here in particular the focus is on whether the characteristics of a PLC support and guide multigrade teachers and principals.

During the process of the development of Prototype 2, the ideas were generated from different approaches (strategies and activities) as evaluation methods (Table 4.9):

- Data from a walkthrough. A walkthrough, based on a checklist, was used for this part of the research as it ensured that the seven principals and the researcher, as participant-as-observer, checked the design with regard to the quality of the key components of the intervention.
- Data from a micro-evaluation as an evaluation method, and interviewing and observing as evaluation activities. The use of observation as evaluation activity allowed this research to validate the interview measure with another measure.
- The significance of using micro-evaluation for this research during the global stage of development meant that the representatives from multigrade education, by already using parts of the prototype outside their day-to-day user setting in Cycle 1:
  - could provide more accurate information about the task, and in a specific context, which required support;
  - could better structure and have more opportunities to negotiate and justify design ideas;

- could identify the requirements and conditions in realistic settings, outside their day-to-day user settings, for which it had been designed and developed; and
- could increase user commitment, ownership and willingness to apply the final product in their teaching.

Prototype 3 – developed during Phase 2: Cycle 2 (Prototyping Phase)

Prototype 3 was developed during Phase 2 in Cycle 2 (Prototyping Phase) and focused on elaborating and adapting the design guidelines and specifications of Prototype 2 to a concrete level for multigrade teachers for use in their day-to-day user setting.

The CMGE planned to use the support system that was used to support the seven principals in developing a manual for multigrade principals, in a new project the following year. Therefore, the CMGE had to ensure that what was learned in developing Prototype 2 could be transferred as a support system to support and guide multigrade teachers and principals in their day-to-day user setting. The Centre also had to make sure that all possible implementation problems were ironed out before they could introduce the support system to a new group, to be used in a different user setting.

Prototype 3 was developed by the seven principals (Table 4.7 and Table 4.8) involved in Cycle 1, and three experts in professional development of multigrade teachers and groupwork in South Africa. They were asked to appraise Prototype 2 to determine the expected practicality and expected effectiveness for multigrade teachers and principals to use Prototype 2 in their day-to-day user setting. Three experts in the field of multigrade education, with experience of professional development of teachers, PLCs, and multigrade education (Table 4.10) in South Africa, were used to conduct an appraisal of support Prototype 2. The sample of experts came from:

- teachers, principals and officials experienced in professional development of teachers;
- teachers, principals and officials experienced in Professional Learning Communities; and
- teachers, principals and officials experienced in multigrade education.

Table 4.10: E**xperts in the field of curriculum, professional development of multigrade teachers and groupwork**

	Field(s) of expert	Total years of teaching experience	Total years of experience in multigrade education	Total years of experience in Professional Learning Communities	Total years of experience in professional development of teachers	Qualification
Expert 1	Curriculum support	41	10	2	15	Doctorate
Expert 2	Curriculum Development & Assessment	25	7	15	11	Doctorate
Expert 3	Multigrade theory and epistemic knowledge	33	10	5	26	Doctorate

Four generic criteria (Table 4.3) were used to guide the appraisal of the expected practicality and expected effectiveness for multigrade teachers and principals to use Prototype 2 in their day-to-day user-setting:

- Relevance (content validity): The components of the support system are based on state-of-the-art knowledge and all components of the support system are consistently linked to one another.
- Consistency (construct validity): The intervention is 'logically' designed and all components should be consistently linked to one another. The characteristics of a PLC should act as clear benchmarks of progress and milestones in order for the multigrade teachers and principals to interact with each other in order to move their PLC in the intended direction of their improvement journey.
- Practicality (expected): The characteristics of the support system are expected to be usable in the settings for which it is designed and developed. Here in particular the focus is on whether the characteristics of a PLC support and guide multigrade teachers and principals.
- Effectiveness (expected): Refers to the concept that it should be possible to realise developers' intentions for multigrade teachers and principals under normal conditions.

During the process of the development of Prototype 3, ideas were generated from different approaches (strategies and activities) as evaluation methods (Table 4.9):

- Data from an expert appraisal.

  The significance of using three experts, in professional development of multigrade teachers and groupwork in South Africa, was that it helped to refine the prototype solutions in practice and through reflection to produce 'design principles and

guidelines' and enhanced prototype solutions for implementation in practice. An interview was used as an evaluation activity to obtain data during the expert appraisal. Comparing the data from the walkthrough with the expert appraisal allowed control of the validity and reliability of the evaluation activities in Cycle 2.

- Data from a walkthrough.

  The significance of using a walkthrough in this research, at that stage of the development, was that it allowed the representatives of the target group that were involved in the micro-evaluation in Cycle 1, to go through the adapted Prototype 1 on paper in order to refine the prototype solutions in practice and through reflection to produce 'design principles' and enhanced prototype solutions for implementation in practice. An interview was used as an evaluation activity to obtain data during the walkthrough.

Prototype 4 – developed during Phase 2: Cycle 3 (Prototyping Phase)

Developed during Phase 2 in Cycle 3 (Prototyping Phase) and focusing on assessing the actual practicality for multigrade teachers and principals to use Prototype 3 in their day-to-day user setting.

The CMGE used Prototype 3 as a support system to support and guide multigrade teachers and principals of 24 multigrade schools (Table 4.11) involved in a year's project to familiarise them with multigrade education methods and empower them to apply those methods. The sample of multigrade teachers and principals came from multigrade schools in the Cape Winelands Education District with the schools (Table 4.11) nearest to the towns of Montagu, Ashton and Bonnievale. The district officers in the Cape Winelands Education District in the Western Cape divided the 24 schools into four PLCs, based on their geographical position:

- Langeberge PLC – Nearest town: Montagu
- Keisie PLC – Nearest town: Montagu
- Middelrivier PLC – Nearest town: Bonnievale
- Prospect PLC – Nearest town: Ashton

Table 4.11: Schools nearest to Montagu, Bonnievale and Ashton in Cape Winelands Education District

	Name of PLC	Multigrade school	Grades	Number of teachers (including the principal)	Nearest town	Education district	Distance to district office (km)
1	Langeberge	School 1	R – 6	3	Montagu	Cape Winelands	150
		School 2	R – 6	3	Montagu	Cape Winelands	93,9
		School 3	R – 6	3	Montagu	Cape Winelands	85,9
		School 4	1 – 6	3	Montagu	Cape Winelands	87,6
		School 5	R – 6	3	Montagu	Cape Winelands	80,7
		School 6	R – 6	3	Montagu	Cape Winelands	103
2	Keisie	School 7	1 – 6	2	Montagu	Cape Winelands	100
		School 8	R – 6	3	Montagu	Cape Winelands	93,3
		School 9	1 – 6	3	Montagu	Cape Winelands	103
		School 10	R – 7	5	Montagu	Cape Winelands	90,2
		School 11	R – 6	2	Montagu	Cape Winelands	92,4
		School 12	R – 6	3	Montagu	Cape Winelands	84,2
3	Middelrivier	School 13	1 – 6	3	Bonnievale	Cape Winelands	89,9
		School 14	R – 7	6	Bonnievale	Cape Winelands	91,9
		School 15	R – 6	3	Bonnievale	Cape Winelands	86,3
		School 16	R – 6	4	Bonnievale	Cape Winelands	92,7
		School 17	1 – 6	3	Bonnievale	Cape Winelands	68,9
		School 18	R – 6	6	Bonnievale	Cape Winelands	77,2
		School 19	R – 6	5	Bonnievale	Cape Winelands	81
4	Prospect	School 20	R – 7	2	Ashton	Cape Winelands	61,7
		School 21	R – 6	3	Bonnievale	Cape Winelands	65,4
		School 22	R – 7	8	Ashton	Cape Winelands	59,7
		School 23	R – 7	7	Ashton	Cape Winelands	60,1
		School 24	R – 6	3	Ashton	Cape Winelands	69

After using Prototype 3 for a year, Prototype 4 was developed to convey the actual practicality and the expected effectiveness of the support system. Prototype 4 was developed in a second micro-evaluation, but this time the target group used the intervention in their day-to-day user setting.

Two generic criteria (Table 4.3) were used to appraise the actual practicality and the expected effectiveness of the support system, in supporting the interaction and collaboration of multigrade teachers and principals in their day-to-day user setting:

- Practicality (actual): The characteristics of the support system are actual and usable in the settings for which they are designed and developed. Here in particular the focus is on whether the characteristics of a PLC actually support multigrade teachers and principals.
- Effectiveness (expected): Refers to the concept that it should be possible to realise developers' intentions for multigrade teachers and principals under normal conditions.

During the process of the development of Prototype 4, ideas were generated from different approaches (strategies and activities) as evaluation methods (Table 4.9):

- Data from a micro-evaluation.

Usually micro-evaluation is used during the partly detailed intervention stage of development where a limited number of representatives of the target group use parts of the prototype outside their day-to-day user setting. The significance of using a micro-evaluation for this research was that it:

- allowed for collaboration, with shared goals, between the researcher and a PLC, working together to produce meaningful changes in a multigrade educational context;
- allowed a limited number of representatives of the target group to use parts of the prototype in their day-to-day user setting;
- allowed the researcher to reduce the experience of the participants to a central meaning, to enter the subjects' 'life world' or 'life setting' and to place himself in their shoes;
- allowed for the explicit intention of investigating reality to be transformed by attending to issues directly experienced and explicitly recognised as problems by the participants in their day-to-day working environment in multigrade schools; and
- allowed participants to search for new and innovative solutions to problems, while also seeking findings that were transferable, actually practicable and socially responsible.

- Interviews, observation, journals and field notes were used as evaluation activities to obtain data to identify the expected practicality of the characteristics of a PLC in order to refine the prototype solutions in practice and through reflection to produce 'design principles' and enhance prototype solutions for implementation in practice. The use of observation, journals and field notes, as observer-as-participant during their meetings as a PLC, guided this research to observe the actual practicality of the characteristics of a PLC. The use of a field worker eliminated a threat, that the researcher might 'go native' during observation and become too attached to the group (Cohen, Manion & Morrison, 2000:129,305), thereby compromising the validity and reliability of this research.

4.4.3 Validity and reliability

Validity and reliability deserve special attention when conducting educational design research. This research, to ensure validity and the reliability, was designed and conducted using four generic criteria for high quality interventions that are applicable to a wide array of educational interventions (Table 4.3).

During the preliminary research, where the emphasis was on analysing the problem and reviewing the literature, the criterion of relevance (content validity) and consistency (construct validity) (Table 4.4) was the most dominant. This was to ensure that the intervention indeed addressed a need and its design was based on state-of-the-art (scientific) knowledge and that the intervention was 'logically' designed. In the beginning of the prototyping stage considerable attention was paid in the formative evaluation, to the criterion of practicality and effectiveness. This was to ensure that the intervention is usable (practicality) in the settings for which it has been designed and developed and that using the intervention results (effectiveness) in desired outcomes.

During the process of the development and evaluation of the prototypes, different strategies and activities (Table 4.9) were used as evaluation methods, aimed at enhancing validity and reliability. In this research a checklist, interviewing, observation, journals, field notes, expert appraisal, walkthrough and micro-evaluation were used to triangulate findings and to enhance the reliability and internal validity of the findings. Reliability was fostered by the fact that the researcher used the same instruments during all interviews and observations. Taking the data and interpretations back to the multigrade educators and principals increased the internal validity of findings.

4.5 Role of the researcher

In this section the role of the researcher during the implementation of the programme of research for Phase 1 and Phase 2 in this research is discussed. It also explains how, by engaging in formative evaluation activities, observation, focusing on participant-as-observer and observer-as-participant, guides a researcher to experience the problems that occur and hear first-hand the suggestions for improvement that the teachers and principals proffer during their use of a prototype.

4.5.1 Observation and participation

Researchers using design research have the explicit intention of investigating reality to be transformed by attending to issues directly experienced and explicitly recognised as problems by the teachers and principals in their day-to-day working environment. Design research also supports collective reflection by including all of the participants, as part of the design research team, in the process of planning, acting, observing and reflecting to achieve change of their unique contexts and backgrounds assigned to them (Fournier, Mill, Kipp & Walusimbi, 2007:2).

Nieveen (2009:99) argues that although for reasons of scientific rigour, the use of external evaluators is often recommended, it seems legitimate or even advisable that design

researchers themselves carry out the formative evaluation of the prototype. By engaging in formative evaluation activities the researchers will experience for themselves the problems that occur and hear first hand the suggestions for improvement that the teachers and principals offer during their use of a prototype.

Adler and Adler (1994) argue that one cannot study the world without being part of it. Patton (1990) supports their statement with the argument that the researcher must be afforded the opportunity to gather 'live' data from 'live' situations and be given the opportunity to look at what is taking place *in situ* (place in a particular location or context) rather than at second hand. Therefore, the researcher must be drawn into the phenomenological complexity of the participants' world where situations unfold and connections, causes and correlations can be observed as they occur over time (Cohen *et al.*, 2000:305-306).

Cohen *et al.* (2000:305), distinguish between four roles (Figure 4.7) that allow a researcher to be drawn, as an observer, into the phenomenological complexity of the participants' world. The role of complete participant allows the researcher to be a member of the group being studied and to conceal his/her researcher role from the group to avoid disrupting normal activity. The role of participant-as-observer allows the researcher to be a member of the group being studied, and the group is aware of the research activity. The role of observer-as-participant allows the researcher to participate in the group activities as desired, yet the main role of the researcher in this stance is to collect data, and the group being studied is aware of the researcher's observation activities. The role of complete observer allows the researcher to be completely hidden from view while observing; however where the researcher is in plain sight in a public setting, the public being studied is unaware of being observed.

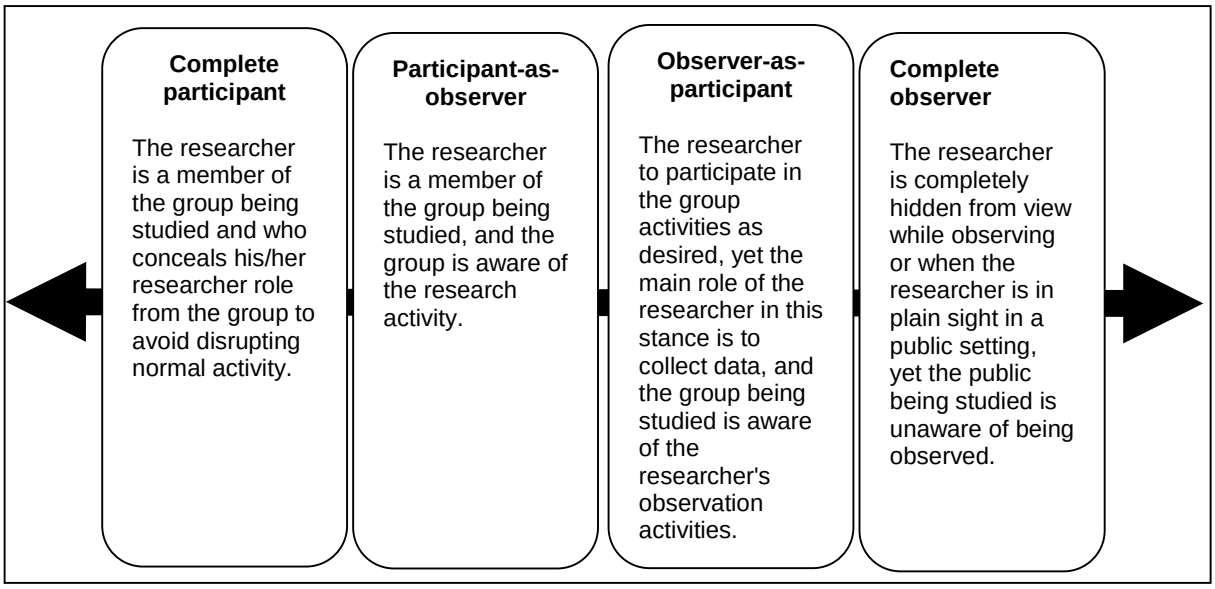


Figure 4.7: Four observation stances: Researcher roles (Adapted from Gold, 1958)

There is an ethical concern regarding the relationships established by the researcher when conducting participant observation – the researcher needs to develop close relationships with the group and should inform them of his/her purpose for being there, sharing sufficient information with them about the research topic so that their questions about the research and the researcher's presence are put to rest (DeWalt & DeWalt, 1998:31). Three stages (making myself know to the community stage, acquaintance stage and intimate stage) are implemented to allow a researcher to move from a position of a formal and ignorant intruder to a welcome and knowledgeable intimate researcher (deMunck & Sobo, 1998:38). In the first stage (making myself known to the community stage), the researcher is a stranger who is learning the social rules and language, making herself/himself known to the community, so they will begin to teach her/him how to behave appropriately in that culture. In the acquaintance stage the researcher begins to merge with the crowd and stand out less as an intruder. In the intimate stage, the researcher has established relationships with cultural participants and is as comfortable with the interaction as the participants are with her/him being there (De Munck & Sobo, 1998:38).

4.5.1.1 Observation and participation in this research

In order to allow this researcher to:

- investigate the world of multigrade teachers;
- be part of their world;
- experience and explicitly recognise the problems of teachers and principals in their day-to-day user setting;
- be afforded the opportunity to gather 'live' data from 'live' situations;
- support collective reflection by including all of the participants, as part of the design research team, in the process of planning, acting, observing and reflecting to achieve change; and
- participate, as a researcher, as a designer in the design process,

this research focused on two observation stances, the participant-as-observer and the observer-as-participant:

4.5.1.1.1 Participant-as-observer

I was a participant-as-observer during the development of Prototype 2. I wanted to participate as the researcher and designer in the design processes of:

- identifying and analysing problems by researchers, teachers and principals in collaboration; and

- developing prototype solutions, informed by state-of-art theory, existing design principles and technology innovations.

Being a participant-as-observer in this research allowed the researcher (as researcher and designer), to be part of the above-mentioned processes and to:

- identify and guide relationships with the members of multigrade schools – investigate the world of multigrade teachers and principals and support collective reflection by including all of the participants, as part of the design research team, in the process of planning, acting, observing and reflecting to achieve change (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1) (Schensul, Schensul & LeCompte, 1999:91);

- be on site over a period of time to familiarise the researcher to the multigrade community, thereby facilitating involvement in sensitive activities to which I generally would not been have invited (Bernard, 1994:142-143) – be part of the world of the multigrade teachers and principals and be afforded the opportunity to gather 'live' data from 'live' situations (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1);

- reduce the incidence of 'reactivity' or people acting in a certain way when they are aware of being observed – be part of the world of the multigrade teachers and principals (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1);

- provide myself with a list of questions to be addressed with the participants that made sense in the native language or was culturally (multigrade) relevant – therefore experience and explicitly recognise the problems of the teachers and principals in their day-to-day user setting, and be afforded the opportunity to gather 'live' data from 'live' situations (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1) (Bernard, 1994:142-143);

- get the feel for how things are organised and prioritised, how people interrelate and what are the cultural (multigrade) parameters – experience and explicitly recognise the problems of the teachers and principals in their day-to-day user setting

(Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1);

- see what the cultural (multigrade) members deem to be important in manners, leadership, politics, social interaction and taboos – experience and explicitly recognise the problems of the teachers and principals in their day-to-day user setting (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1);

- become known to the cultural (multigrade) members, thereby easing facilitation of the research process – experience and explicitly recognise the problems of the teachers and principals in their day-to-day user setting (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1) (Schensul *et al.*, 1999:91); and

- have a better understanding of what is happening in the culture (multigrade), which lends credence to my interpretations of the observation – experience, and explicitly recognise the problems of the teachers and principals in their day-to-day user setting (Educational design processes: identifying and analysing problems by researchers, teachers and principals in collaboration – Figure 4.1) (Bernard, 1994:142-143).

In Cycle 2 (Prototype 3) no observation was used to collect data. Observation was not needed at that stage because the development of prototype solutions did not take place either in practice or in a 'live' situation in the day-to-day user setting of the teachers and principals of multigrade schools. A walkthrough and an expert appraisal were suffcient enough to obtain data to design Prototype 3.

4.5.1.1.2 Observer-as-participant

The researcher in this research was an observer-as-participant during the development of Prototype 4. As the focus of the design processes of the design research approach shifted, from identifying and analysing problems by researchers, teachers and principals in collaboration and developing prototype solutions, informed by state-of-art theory, existing design principles and technology innovations, to:

- iterative cycles of testing and refinement of solutions in practice; and

- reflection to produce 'design principles and guidelines' and enhance solution implementation in practice,

my focus as observer and designer changed from a researcher, as a member of the group being studied in order to develop prototype solutions, to a researcher and designer, that participated in the group activities as desired. My main role, as the researcher and the designer, in this stance, was to collect data to improve Prototype 3.

In this research the researcher was not a member of the group (24 schools that functioned in four PLCs in Circuit Eight in the Cape Winelands Education District in the Western Cape), and his interest in participating was to:

- interact closely enough with members of the PLC to establish an insider's identity without participating in those activities constituting the core of group membership (Adler & Adler, 1994:380) – be part of the world of the multigrade teachers and principals and be afforded the opportunity to gather 'live' data from 'live' situations (Educational design processes: iterative cycles of testing and refinement of solutions in practice by researchers, teachers and principals in collaboration, reflection to produce 'design principles' and enhance solution implementation in practice – Figure 4.1);

- conduct better observation – investigate the world of multigrade teachers and support collective reflection by including all of the participants, as part of the design research team, in the process of planning, acting, observing and reflecting to achieve change (Educational design processes: iterative cycles of testing and refinement of solutions in practice by researchers, teachers and principals in collaboration, reflection to produce 'design principles' and enhance solution implementation in practice – Figure 4.1); and

- generate more complete understanding of the group's activities – investigate the world of multigrade teachers and support collective reflection by including all of the participants, as part of the design research team, in the process of planning, acting, observing and reflecting to achieve change (Educational design processes: iterative cycles of testing and refinement of solutions in practice by researchers, teachers and principals in collaboration and reflection to produce 'design principles' and enhance solution implementation in practice – Figure 4.1).

4.6 Ethical considerations

Approval to work with all the teachers, principals and schools was obtained, prior to the commencement of the research, by the CMGE from officials of the West Coast Education District, the Cape Winelands Education District, and the Overberg Education District. The CMGE informed the officials of the plans, aims and methods of data collection of this

intervention and research. The officials were assured that the research would not threaten school policy, management styles, or individual teachers. The officials were involved during the intervention and were informed on a regular basis of the progress of the PLC intervention.

The participants had the choice whether or not they wished to participate in this research. They were told and they understood the purpose of this research, the role of the researcher as an observer, and their role as participants in a PLC. The plans, aims and methods of data collection of this intervention and research were also discussed. To protect the privacy of each participant and their school, the anonymity of the participants and the schools involved was kept confidential and, in no way, did the processing of the participants' viewpoints, experiences, responses and contributions reveal their identity.

To preclude the research design and the diversity of the data-gathering methods in this research hampering the participants' rights to confidentiality and dignity (personal embarrassment and humiliation), these issues were addressed by all the role players during each cycle in each Phase and meetings with the researcher and members of the PLCs.

4.7 Conclusion

In this chapter the research design for this research was introduced with specific emphasis on the design research methodology. The choice of a pragmatic paradigm and the methodological quality of this research was also elaborated upon, with a discussion of the dual role of the researcher's status as participant-as-observer and observer-as-participant. Chapter 5 will focus on a detailed discussion of the research results, findings and design guidelines for each cycle.

CHAPTER 5

PRELIMINARY PHASE: NEEDS AND CONTEXT ANALYSIS

5.1 Introduction

Chapter 4 introduced the research paradigm and educational design research, as a research approach suitable to address complex and 'wicked' problems in educational practice in multigrade education in South Africa for which no clear guidelines for solutions are available. This research consists of two phases, the Preliminary Phase and the Prototyping Phase. Chapter 5 takes a closer look at the Preliminary Phase that focuses on conceptualising the PLC as a support system for multigrade teachers and principals, and defines the design specifications of a PLC. The information derived from the literature review (Chapter 3), as well as the prior needs and context analysis, is discussed in this chapter. The Prototyping Phase is discussed in Chapter 6.

The focus of this chapter in terms of the overall research cycles is discussed in Section 5.2. Section 5.3 elaborates on how design principles and guidelines, necessary for the optimised support system for multigrade teachers and principals, in this phase were generated from the current needs, situation, problems and challenges with specific reference to the role that the MGRSI, the case study, the baseline study and the focus group interview with seven principals of rural multigrade schools played. The design principles and guidelines derived from the literature in Chapter 3 are provided in Section 5.3.5. Section 5.4 discusses the need for a support system in a multigrade context. Section 5.5 introduces the design principles and guidelines for the first support prototype, derived from the proposed guidelines from the MGRSI, the case study, the baseline study, the questionnaire and the focus group interview, together with the principles and guidelines from the literature review.

5.2 Research phases and cycles

This research addresses fundamental problems in educational practice in multigrade education in supporting and guiding multigrade teachers and principals in South Africa. Design researchers should strive for generalisable design principles and guidelines in the meaning of generalising to a broader theory and with the aim of contributing to the body of knowledge or a theory in the domain of research. When design research is conducted within the framework of a programme of research addressing fundamental problems in educational practice, it will result in a specific body of knowledge, *viz*., substantive and procedural design principles and guidelines that may contribute to improve education (Plomp, 2009:10, 33).

The development of four prototypes, Prototypes 1 – 4 (Figure 4.6), was needed during the evolutionary prototyping process in this research to develop solutions for a support system prototype to support multigrade teachers and principals in multigrade schools in South Africa:

- Prototype 1, developed during Phase 1 – Preliminary Phase (Figure 5.1), focused on generating and identifying current design guidelines and specifications of a support system, as a first draft for this research.
- Prototype 2, developed during Phase 2: Cycle 1 (Prototyping Phase), focused on elaborating and adapting the design guidelines and specifications of Prototype 1 to a concrete level for multigrade teachers and principals for use outside their day-to-day user setting.
- Prototype 3, developed during Phase 2: Cycle 2 (Prototyping Phase), focused on appraising the expected practicality for multigrade teachers and principals to use Prototype 2 in their day-to-day user setting.
- Prototype 4, developed during Phase 2: Cycle 3 (Prototyping Phase), focused on assessing the actual practicality for multigrade teachers and principals to use Prototype 3 in their day-to-day user setting.

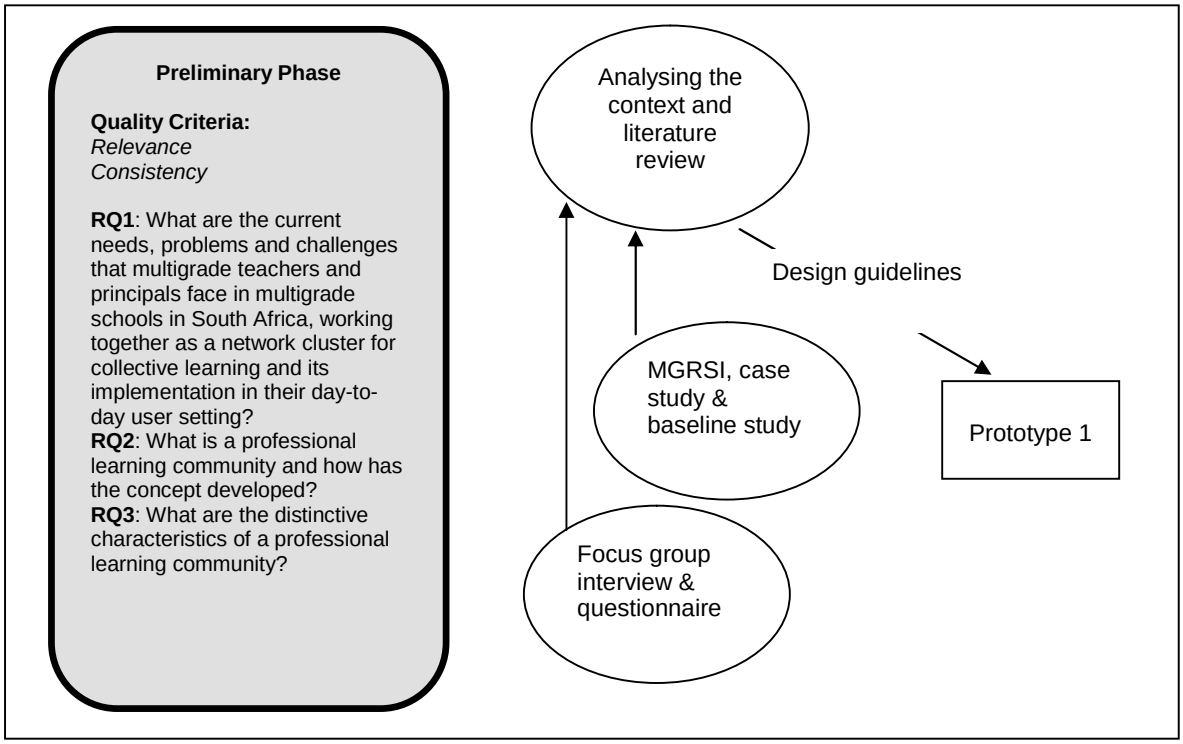


Figure 5.1: Preliminary Phase – Phase 1

5.3 Prior development, needs and context analysis

Multigrade teachers and principals participating in the MGRSI in 2002 expressed a need for support systems that could strengthen and nourish newly attained knowledge and skills of teachers by means of continuous support strategies. It was necessary to develop design principles and guidelines to ensure that they had the necessary procedures (procedural emphasis) in place to ensure a support system that was characterised (substantive emphasis) by:

- a solid foundation consisting of a collaboratively developed and widely shared mission, vision, values and goals;
- collaborative teams that work interdependently to achieve common goals; and
- a focus on results as evidenced by a commitment to continuous improvement and implementation.

In order to accomplish the above, a number of approaches were employed:

- a literature and research review of a PLC (discussed in Chapter 3);
- a literature review of the MGRSI (discussed in Chapter 2, Section 2.4);
- a literature review of a case study (Boonzaaier, 2008) which revealed the successes and challenges of the MGRSI, focusing on the needs of multigrade schools and ways to address those needs, implemented from 2001 to 2006; and
- a literature review of a baseline study (Centre for Multigrade Education, 2009) on multigrade education in South Africa.

This was supplemented with a focus group interview and questionnaire with seven principals of rural multigrade schools, which were part of a project for a year at the CMGE; these were asked to function as a PLC in order to gain a better understanding of their challenges in context. The Preliminary Phase therefore pertained to the sub-questions:

1. What are the current needs, situation, problems and challenges of multigrade teachers and principals in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting?

2. What is a professional learning community and how has the concept developed? (This, discussed in Chapter 3, Section 3.1), focused on identifying what a professional learning community was and how the concept had developed.

3. What are the distinctive characteristics of a professional learning community? (This was discussed in Chapter 3, Section 3.3), and focused on identifying the distinctive characteristics of a professional learning community, in supporting teachers and principals.

The evaluation information for the Preliminary Phase was therefore aimed at generating design principles and guidelines relating to the design specifications for a possible support system to multigrade teachers and principals in multigrade schools in South Africa:

> Design specifications and global design: Determining the components necessary for the optimised support system and providing a first elaboration of the intervention, in which some or all of the components were given form.

The evaluation in the Preliminary Phase focused specifically on the evaluative foci (discussed in Section 4.3.3 and Table 4.3) of relevance and consistency:

- Relevance (content validity): The components of the support system are based on state-of-the-art knowledge and all components of the support system are consistently linked to one another in order to provide support and guidance to multigrade teachers and principals.
- Consistency (construct validity): The intervention is 'logically' designed and all components should be consistently linked to one another. The characteristics of a PLC should act as clear benchmarks in order to provide support and guidance to multigrade teachers and principals.

The following section elaborates on how design principles and guidelines, necessary for the optimised support system for multigrade teachers and principals, in this phase are generated from the current needs, situation, problems and challenges, with specific reference to the role that the MGRSI plays.

5.3.1 Pre-existing support systems of the Multigrade Rural Schools Initiative

The urgency of an intervention to support the special needs of multigrade schools in South Africa may be traced to about 1999, when an Education Quality Improvement Partnership (EQUIP) initiative (as part of the WCED's contribution to the National Rural Upliftment Plan) was discussed with the WCED and the National Business Initiative (NBI) as partners. The main intervention mode consisted of INSET and the key objective was to develop multigrade education in rural schools through professional growth, resources and support to teachers and principals to gain a measurable improvement in learners' performance in reading and mental maths as well as a positive attitude among teachers and principals towards lifelong

learning (Mouton, 2003:3).

The support system of the MGRSI (discussed in Chapter 2) was situated in the cluster teams at the District officials' level (Figure 2.2 in Chapter 2), with the purpose of providing ongoing relevant support to multigrade schools (Table 5.1).

Table 5.1: Purpose to provide ongoing relevant support to multigrade schools of the MGRSI (Adapted from Mouton, 2003)

Purpose of cluster teams	**Cluster teams** (Substantive emphasis)	**Procedures** (Procedural emphasis)
Provide ongoing relevant support to multigrade schools. *Support that focused on*: • organisational and management support; • support in the learning areas and curriculum development; and • preventing that things "go wrong" and providing support where things have indeed gone awry. *in six identified areas* • learning spaces and classroom organisation; • classroom routines and discipline; • curriculum structuring and planning; • teaching strategies; • self-directed strategies; and • peer tutoring.	Officials at District who are knowledgeable, informed and competent with regard to multigrade education. Ongoing support by multifunctional teams. Motivating feedback to and support for teachers.	Establish a training committee to co-ordinate training in accordance with policy framework. Co-ordination and implementation of training in each District. Training to officials. Provision of information to officials via the website. Establish multi-functional teams and define tasks for each cluster. Training of multi-functional teams and ongoing support to teachers and schools.

In order to provide ongoing relevant support to multigrade schools, the MGRSI had to ensure that they had the necessary procedures (procedural emphasis) in place to ensure cluster teams that were characterised (substantive emphasis) by (Table 5.1):

- officials at District that were knowledgeable, informed and competent with regard to multigrade education;
- multifunctional teams that delivered ongoing support; and
- motivating feedback and support to the teachers and principals (Mouton, 2003).

The significance of the support system of the MGRSI for this research is that it provided the first format of the heuristic statement, based on the heuristic statement of Van den Akker (1999) (discussed in Section 1.1), which guided the design research process for this research (Table 5.2): If you want to design the PLC Intervention (X) for providing ongoing relevant support and guidance to multigrade schools that focus on support to all multigrade

teachers and principals working together as a network cluster for collective learning and its implementation in a multigrade classroom (Y) in multigrade schools in South Africa (Z), then you are best advised to give that intervention the characteristics A, B and C [substantive emphasis], and to do that via procedures K, L and M [procedural emphasis], because of arguments P, Q and R.

Table 5.2: First format of the heuristic statement, which will guide the design research process for this research (Adapted from Van den Akker, 1999)

If you want to design intervention X				
Professional Learning Community Intervention (PLCI)				
for the purpose/function Y	*in context Z*	*then you are best advised to give that intervention the characteristics A, B, and C [substantive emphasis]*	*and to do that via procedures K, L, and M [procedural emphasis]*	*because of arguments P, Q, and R.*
Purpose/Function	**Context**	***Substantive emphasis***	***Procedural emphasis***	**Arguments**
Provide ongoing relevant support and guidance to multigrade schools. Support and guidance that focus on: support to all multigrade teachers and principals working together as a network cluster (PLC) for collective learning and its implementation in a multigrade classroom.	Multigrade schools in South Africa	*Characteristics*	*Procedures*	

The next section elaborates on how design principles and guidelines, necessary for the optimised support system for multigrade teachers and principals in this phase are generated from the current needs, situation, problems and challenges with specific reference to the role the case study of Boonzaaier (2008) plays.

5.3.2 Case study to reveal the successes and the challenges of the MGRSI

The case study of Boonzaaier (2008:296), illustrating the successes and challenges of the MGRSI implemented from 2001 to 2006, supports the findings of Mouton that the officials admitted that some of them, as identified in the weaknesses (Table 2.7 in Chapter 2) of the MGRSI, did not have any understanding of the training and that it was an indication that the support staff did not yet feel fully equipped to support multigrade schools with regard to the

foci (classroom management techniques, instructional strategies and planned and instructional materials) of the MGRSI (Figure 5.2).

This case study made it clear that (Figure 5.3):

- the management structure had high expectations with regard to how prepared the officials should be and the role that support should play in this process;
- although the frequency of responses relating to the intended cluster level outcome (officials were knowledgeable, informed and competent) was of the highest (88,9%) of all the intended outcomes in this category, the overall cluster level outcome which relates to the capacity of officials and teachers to lead and to support the teachers, was on average the lowest (44,2%);
- although the knowledge, ability and competency of the officials who visited the schools were highly valued, the teachers' input also confirmed that they experienced the amount of support, provided by various officials, differently and that the experience of the support (for the foundation phase respondents) was more motivational (Figure 5.3); and
- although the support systems should have strengthened and nourished the newly attained knowledge and skills of the teachers by means of continuous support strategies, the lack of frequent visits hampered the quality of the follow-up support.

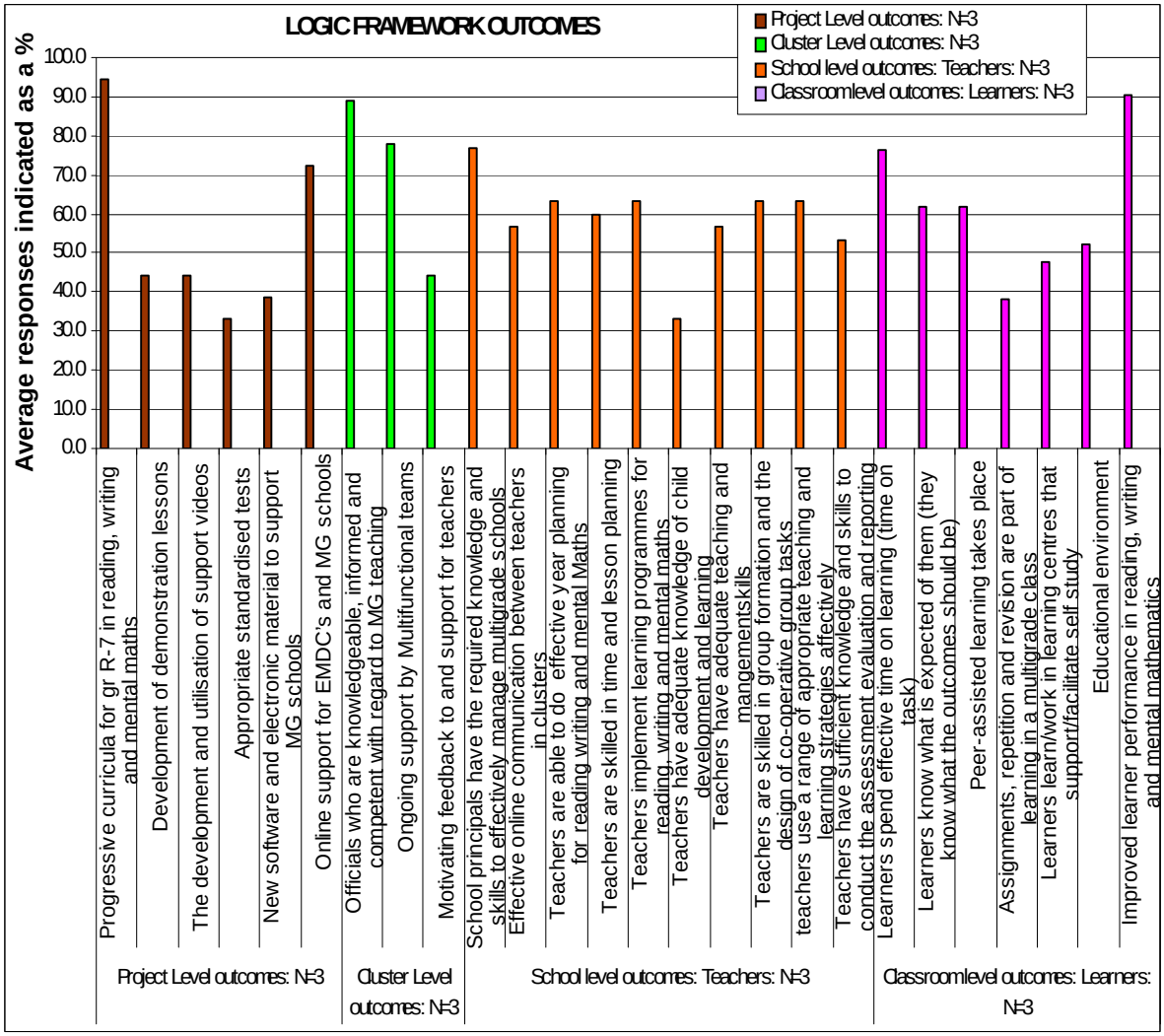


Figure 5.2: Expectation of respondents, who were involved in the project at management level and what outcomes of the MGRSI were most successfully reached (Boonzaaier, 2008:203)

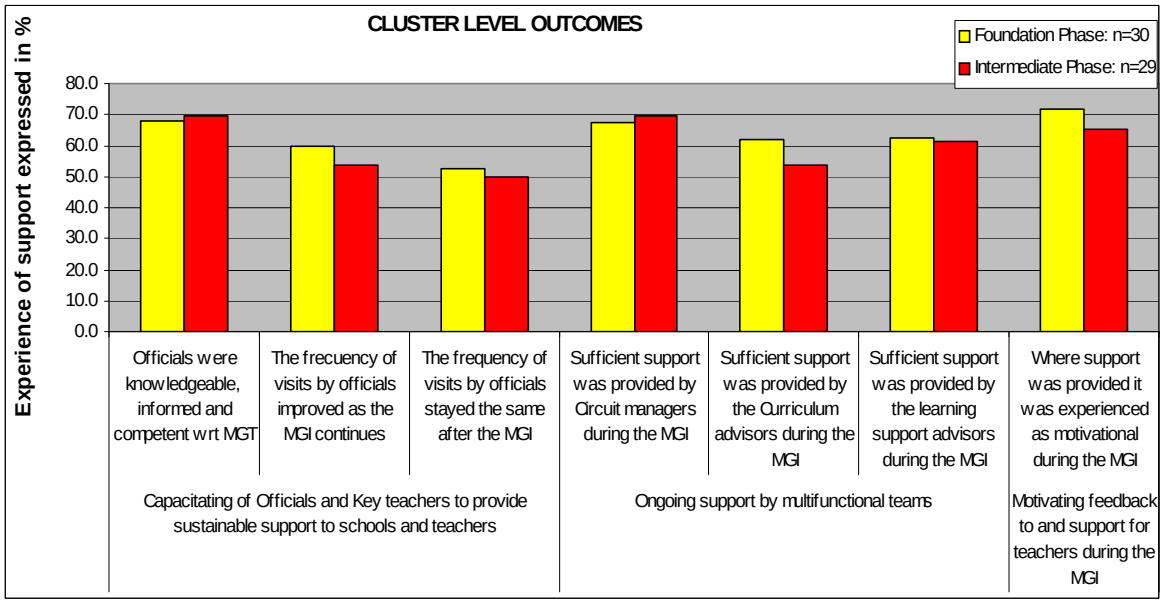


Figure 5.3: Perception of school level respondents with regard to the manner in which the cluster level outcomes were reached (Boonzaaier, 2008:216)

Based on Boonzaaier's research (2008), the following principles and guidelines were important in introducing and establishing ongoing relevant support and guidance to multigrade teachers and principals:

Cluster teams that are characterised by:

- all multigrade teachers and principals planning together in clusters and sharing their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge; and
- implementation cycles, which make provision for expansion, sustainability and ownership by all multigrade teachers and principals (Boonzaaier, 2008:295, 343).

Procedures in place:

- Ensure that all the multigrade teachers and principals have mutually internalised the reason, the purpose, the content, the context and the strategy to follow.
- Provide the multigrade teachers and principals, not only with theoretical knowledge and skills, but also with simulated and demonstrated practical knowledge and skills.
- Support and guide the multigrade teachers and principals in how to assess their own teaching practices, taking into consideration their prior knowledge, experience and their individual needs.

- Provide follow-up strategies, which should build on the needs identified and contribute towards multigrade teachers' and principals' willingness to participate in the intervention and provide them with confidence to share with others.

- Provide follow-up strategies to create opportunities for multigrade teachers and principals to be skilled or to be re-skilled to prevent the learning from the initial training to dissipate (Boonzaaier, 2008:259, 351-353).

The significance of these guidelines is that it provided the first specific and context-dependent rules to guide the design research process in order to determine the substantive and procedural emphasis for this research (Table 5.3).

Table 5.3: Specific and context-dependent rules to determine the substantive and procedural emphasis for this research (Adapted from Boonzaaier, 2008)

Professional Learning Community Intervention (PLCI)			
Purpose/Function	**Context**	***Substantive emphasis***	***Procedural emphasis***
Provide ongoing relevant support and guidance to multigrade schools. Support and guidance that focuses on: support to all multigrade teachers and principals working together as a network cluster (PLC) for collective learning and its implementation in a multigrade classroom.	Multigrade schools in South Africa	**Cluster teams that are characterised by:** Planning together in clusters and sharing their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge. Implementation cycles, which make provision for expansion, sustainability and ownership by all multigrade teachers and principals.	**Procedures in place that:** Ensure that all the multigrade teachers and principals have mutually internalised the reason, the purpose, the content, the context and the strategy to follow. Provide the multigrade teachers and principals, not only with theoretical knowledge and skills, but also with simulated and demonstrated practical knowledge and skills. Support and guide the multigrade teachers and principals in how to assess their own teaching practices, taking into consideration their prior knowledge, experience and their individual needs. Provide follow-up strategies, which should build on the needs, identified and contribute towards multigrade teachers' and principals' willingness to participate in the intervention and will provide them with confidence to share with others. Provide follow-up strategies to create opportunities for multigrade teachers and principals to be skilled or to be re-skilled to prevent the learning from the initial training to dissipate.

The following section elaborates on how design guidelines, necessary for the optimised support system for multigrade teachers and principals, in this phase are generated from the current needs, situation, problems and challenges with specific reference to the role that the baseline study plays.

5.3.3 Baseline study of the Centre for Multigrade Education

A baseline study, compiled by Boonzaaier (Centre for Multigrade Education, 2009:11), of the Centre for Multigrade Education situated in Wellington in South Africa, conducted in the nine provinces in South Africa (Limpopo, Mpumalanga, North-West, Gauteng, Free State, KwaZulu-Natal, Eastern Cape, Northern Cape and Western Cape), with the aim (Table 2.8 in Chapter 2) of collecting all relevant information from which the real circumstances of multigrade education in the classrooms might be obtained, identified that the problem in supporting multigrade teachers and principals in South Africa was substantial and daunting, and that a solution to the problem would lead to significant advances in learning or at least a significant reduction in malfunction in the multigrade educational system.

The baseline study (Centre for Multigrade Education, 2009) did not just expose the lack of support and support systems that were still not addressed in South Africa, but also exposed the extent of the problem and the specific needs (Table 2.9 in Chapter 2) of the teachers and principals at each level involved with multigrade education in South Africa. Most teachers and principals involved in the above-mentioned baseline study in the Western Cape had not received official training in multigrade education and were experiencing a lack of training and support with regard to multigrade education (Figure 5.4).

The reasons offered for experiencing network clustering as problematic for multigrade teachers and principals (Figure 5.4) were poor or no communication, lack of interest, the distance between the schools, the poor roads, the lack of transport, and the time teachers and principals had to travel. The baseline study showed that where teacher networks had been established, the teachers and principals came together once a week, once a month or once a term to do planning for work schedules, lesson plans and standardised tests (Centre for Multigrade Education, 2009:47).

It was also evident from the baseline study that, owing to the extent of the problems experienced at each level involved with multigrade education in the education system in South Africa, chances were slight that support for and guidance to multigrade teachers and principals would come from officials and curriculum advisers (Figure 5.4).

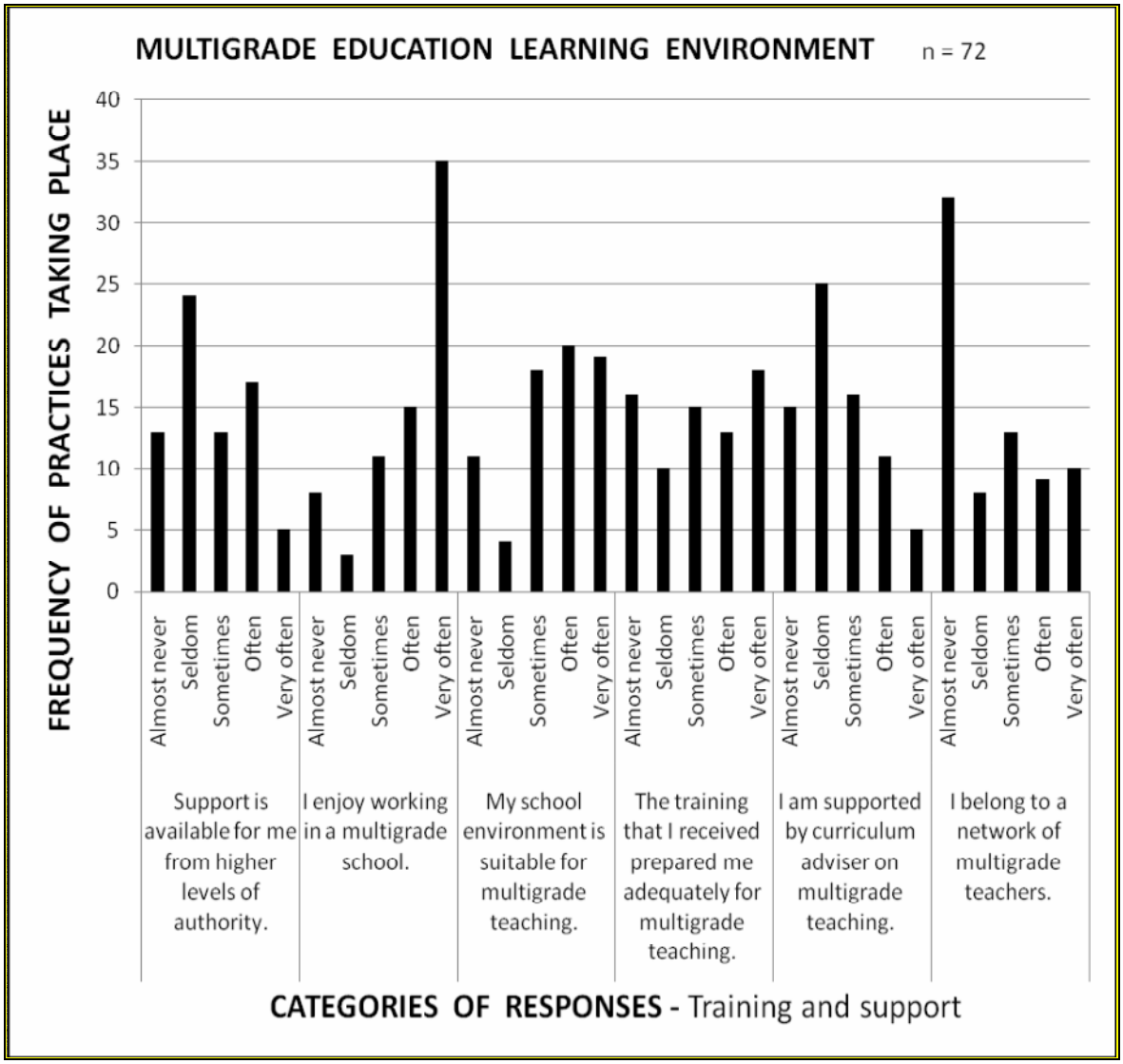


Figure 5.4: Training and support (Centre for Multigrade Education, 2009:45, 49)

Based on the baseline study (Centre for Multigrade Education, 2009:55), the following guideline was important in introducing and establishing ongoing relevant support for multigrade teachers and principals:

- all the role players who formed part of the school community should share in the norms, values and vision of the school and its learners.

The significance of the baseline study for this research is that it exposed the different levels involved with multigrade education in South Africa and gave an indication of the role players that needed to be involved in the cluster teams.

The following section elaborates on how design guidelines, necessary for the optimised support system for multigrade teachers and principals in this phase are generated from the

current needs, situation, problems and challenges, with specific reference to the role of the focus group interview and questionnaire with seven principals of rural multigrade schools.

5.3.4 Interview and questionnaire with seven principals of rural multigrade schools

Seven multigrade teachers and principals (Table 4.7 in Chapter 4) with experience of multigrade education and of being principals of multigrade schools, which were part of a project to develop the leadership of multigrade principals for a year at the CMGE, were asked to function as a PLC to construct a manual for multigrade principals in South Africa. It was their first time functioning as a PLC.

The data were generated through a focus-group interview to identify their unique needs and challenges in a multigrade context and a questionnaire (Appendix A), the Professional Learning Community Assessment (PLCA) (Huffman & Hipp, 2003:70-73), to assess their perceptions of the characteristics of a PLC in supporting multigrade teachers and principals, involved in their own learning and understanding in the complexity and context of the actual classroom situation and according to the needs they wanted to address. Data from the completed questionnaires was captured in *SPSS* for descriptive analysis of frequencies in order to determine the frequency table (Appendix B), their perceptions and their needs. The interview was digitally recorded and transcribed (Appendix C).

The analysis of data, based on inductive logic where the researcher had to immerse himself in the data in order to allow the themes to be constructed, was aimed at organising, describing and interpreting the data by trying to identify patterns or themes and constructing a framework through which this essence could be communicated meaningfully.

The data (Appendix B) from the questionnaire, based on statements about practices (based on the five dimensions of a professional learning community) that occurred in their schools, made it clear that:

- 78% of the statements, based on the five dimensions of a professional learning community, occurred in their schools (highest average between 71.4% and 100%);
- opportunities were not always provided for staff to initiate change (was on average one of the lowest with 57,1%);
- decision-making did not always take place by committees and through communication across grade and subject areas (was on average one of the lowest with 57,1%);

- stakeholders did not always share responsibility and accountability for learner learning without evidence of imposed power and authority (was on average the lowest with 28,6%);
- stakeholders were not always actively involved in creating high expectations that served to increase learner achievement (was on average one of the lowest with 57,1%);
- a variety of opportunities and structures did not always exist for collective learning through open dialogue (was on average one of the lowest with 42,9%);
- opportunities did not always exist for coaching and mentoring (was on average one of the lowest with 42,9%);
- time was not always provided to facilitate collaborative work (was on average one of the lowest with 57,1%);
- fiscal resources were not always available for professional development (was on average one of the lowest with 42,9%);
- resource staff did not always provide expertise and support for continuous learning (was on average one of the lowest with 42,9%); and
- communication systems did not always promote a flow of information across the entire school communities, including, central offices, personnel, parents and community members (was on average one of the lowest with 57,1%).

Based on the focus-group interview, the principals proposed the following guidelines as a requirement to introduce and establish ongoing relevant support to multigrade teachers and principals:

- take the context of multigrade education into consideration;
- support at the levels where multigrade teachers and principals are struggling or need help;
    - help new teachers to function in multigrade classrooms and guide them to be successful;
    - support teachers in obtaining certain skills; and
    - help teachers to plan lessons and to implement them in their classrooms;
- simplify support; it should make sense and add value to multigrade education in order to allow the teachers and principals to buy into the system to implement something new (according to their vision and goals) in the classrooms;

- evaluate whether something will work;
- describe good practices and do research together into best practices;
- create a platform where teachers and principals can obtain knowledge and skills before they go back and use them in their schools; and
- create a platform where the knowledge of shared leadership can be developed.

The significance of these guidelines is that they provided the first specific and dependent rules of the conditions, in the realistic settings for which they should be designed and developed.

The next section elaborates on how design principles and guidelines, necessary for the optimised support system for multigrade teachers and principals, in this phase are generated from the current needs, situation, problems and challenges with specific reference to the role that the literature and research review of a PLC plays.

5.3.5 Design principles and guidelines from literature and research review of a PLC

Most of the literature (discussed in Chapter 3) is centred on the five dimensions of Hord (1997:26) of a PLC (supportive and shared leadership; shared values and vision; collective learning; supportive conditions; shared practice). The five dimensions formed the point of departure, as foundational principles, for researchers, who had worked with a PLC through their own research and practice (InPraxis Group Inc., 2006:11).

Authors and researchers in existing literature presented a combination of declarations of the characteristics of a PLC as necessary to their descriptions of a PLC and in their unique context. Some overlap existed among these declarations, but while they did provide a great benefit, it was arguable that each declaration only provided a view of a PLC within a certain context.

For the purpose of this research, the models of a PLC of DuFour *et al.* (2008) and The Annenberg Institute for School Reform (2003:3-4) were used to analyse existing literature and research on a PLC (discussed in Chapter 3). The overall premise of their models of a PLC was that teachers should work collectively to build a PLC and to achieve this they should create infrastructures that enabled collaborative practices. Their models, selected for this research, described a PLC as an infrastructure for deliberate and collective planning with the capacity to alter the professional practices, beliefs and understanding of teaching. They categorised their models into three distinctive themes: 1) a solid foundation consisting of a collaboratively developed and widely shared mission, vision, values and goals, 2) collaborative teams that work inter-dependently to achieve common goals, and 3) a focus on

results as evidence by a commitment to continuous improvement. Embedded within these three themes they outlined six key elements which served as the conceptual framework for their models: supportive and shared leadership capacity; shared mission, vision, values and goals; a collaborative culture with the focus on learning; collective enquiry into best practice and current reality; action orientation: learning by doing; and a commitment to continuous improvement.

The PLC characteristics were the processes acting upon supporting and guiding multigrade teachers and principals as active participants involved in their own learning and understanding in the complexity and context of the actual classroom situation and according to the needs they wanted to address. The teacher and principal were impacted by the collaboration and support process directed by the professional learning community, and the support and guidance were measured by the effect on collective learning and its implementation in a classroom and the school.

The guiding principles of a PLC were grounded in the premise that teachers and principals should work collectively to build a PLC and to achieve this they should create infrastructures that enabled collaborative practices. In view of the information obtained from the literature review (Chapter 3), the following guiding principles and guidelines (Table 5.4) of a PLC were formulated to guide the design and the formative evaluation of a support prototype for multigrade teachers and principals:

Table 5.4: Design principles

Principles	Guidelines
Characteristic 1 Supportive and shared leadership	• build internal capacity for leadership necessities; • share responsibility for leadership; • create a context supportive of change; • provide time for collaboration; • identify critical questions that must guide the work of the collaborative teams; • guide the teams to create products as a result of their collaboration; • plan and provide resources; • provide teams with relevant data and information; • check the progress; and • provide continuous assistance.
Characteristic 2 Shared mission, vision, values and goals	• develop, articulate and communicate the intended change through a shared: - mission – our purpose for working together as a PLC; - vision – a clear direction that we want to go towards; - values – collective commitments; and - goals – indicators, timelines and targets.
Characteristic 3 Collaborative culture with the focus on learning	• work together interdependently to analyse and to impact professional practice in order to improve results for your learners, your team and your school.

Principles	Guidelines
Characteristic 4 Collective enquiry into best practice and current reality	• collective enquiry into best practice about teaching and learning and your current reality; and • an honest assessment of your current practices.
Characteristic 5 Action orientation: learning by doing	• turn aspirations into action and vision into reality; and • develop a deeper and more profound knowledge and greater commitment from learning by doing.
Characteristic 6 Commitment to continuous improvement	• gather evidence; • develop strategies and ideas; • implement the strategies and ideas; • analyse the impact of changes/results; and • apply the new knowledge in the next cycle of continuous improvement.

1. Principle: Supportive and shared leadership – enhances supportive and shared leadership capacity in order to empower all members of a PLC to share in the vision and mission and to make effective decisions that positively affect learning and achievement.
2. Principle: Shared mission, vision, values and goals – specify what teachers and principals will start doing immediately to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones on the improvement journey.
3. Principle: Collaborative culture with the focus on learning – acts as a strategic vehicle for getting the work accomplished and for moving the organisation into the future.
4. Principle: Collective enquiry into best practice and current reality – engages and supports the members of a PLC in collective enquiry into (1) best practices about teaching, (2) a candid clarification of their current practices, and (3) an honest assessment of the teachers' learning to move beyond discussions and to help them to focus on areas that can contribute to significant improvement.
5. Principle: Action orientation: learning by doing – provides and serves as the 'fuel' for a PLC to take action in describing the behaviours that are required by an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation.
6. Principle: Commitment to continuous improvement – analyses the impact of the changes and applies the new knowledge in the next cycle to enhance continuous improvement.

The significance of the design principles and guidelines from the literature and research review of a PLC is that it formed the foundational principles and guidelines for this research,

based on results of previous research.

5.4 Discussion

If one wants to design the Professional Learning Community Intervention (X) for providing ongoing relevant support and guidance to multigrade schools that focuses on support to all multigrade teachers and principals working together as a network cluster (PLC) for collective learning and its implementation in a multigrade classroom (Y) in multigrade schools in South Africa (Z), then one is best advised to give that intervention the characteristics A, B and C [substantive emphasis], and to do that via procedures K, L and M [procedural emphasis], because of arguments P, Q and R. (Adapted from Van den Akker, 1999, and discussed in Section 5.3.1) The purpose (Y) of the Preliminary Phase is not to prove what the problems are but to identify the problems and to see how the current situation in multigrade education in South Africa can be improved.

It is clear that the problem in supporting multigrade teachers and principals (see Chapter 2) is substantial and daunting, and that a solution to the problem will lead to significant advances in learning or at least a significant reduction in malfunction of a support system in the multigrade educational system. There is therefore a definite need (relevance criterion) for this research. The data from the MGRSI, the case study, the baseline study, the questionnaire and the focus-group interview reveals in context (Z) what the needs, situation, problems and challenges are.

The data shows that in order to provide ongoing relevant support and guidance to multigrade schools, the support system should not only focus on the officials at the District Offices to provide ongoing relevant support to multigrade schools, but should focus on all role-players, as active participants. This will allow all role-players to plan together in clusters and to share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge. By also including implementation cycles, the support system will make provision for expansion, sustainability and ownership by all stakeholders.

The data also shows that although to a certain degree practices (based on the five dimensions of a professional learning community) do occur in the multigrade schools, many teachers and principals in multigrade schools do not have procedures or a system in place to support all role-players.

The need to improve support to all role-players definitely does exist. The findings indicate that multigrade teachers and principals need a support system that will fit their multigrade context – a support system that must be simplified, make sense and add value to multigrade education in order to allow multigrade teachers and principals to buy into the system to

implement something new in the classrooms. Because of the lack of support from external sources for multigrade education, multigrade teachers and principals need clear guidelines, theoretical knowledge, skills and training.

5.5 Design principles and guidelines for first support prototype

The proposed guidelines from the MGRSI, the case study, the baseline study, focus-group interview and questionnaire, together with the principles and guidelines from the literature review, provided the fundamental guidelines and principles for the components of the first support prototype, developed by the researcher, for this intervention. The support system should include the following guiding principles (characteristics), obtained from reviewed literature: multigrade role-players that plan and work together; supportive and shared leadership; shared mission, vision, values and goals; collaborative culture with the focus on learning; collective enquiry into best practice and current reality; action orientation – learning by doing; and a commitment to continuous improvement. The design guidelines for these guiding principles (characteristics) are now discussed:

I. Multigrade teachers and principals plan and work together in a PLC

Rather than becoming a reform initiative itself, the teachers and principals of multigrade schools in South Africa must:

a. Provide and create a PLC, own infrastructure and platform.
b. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge.

II. Supportive and shared leadership

To enhance a supportive and shared leadership capacity in order to empower all members of a PLC to share in the vision and mission and to make effective decisions that positively affect learning and achievement they must:

a. Build internal capacity for leadership among the team members.
b. Share responsibility for leadership among the team members.
c. Create a context supportive of change.
d. Provide time for the team to collaborate.
e. Identify critical questions that should guide the work of the collaborative team.
f. Guide the team to create products as a result of their collaboration.
g. Plan and provide resources for the team.

h. Provide the team with relevant data and information.

i. Check the team's progress.

j. Provide continuous assistance to the team and the team members.

III. Shared mission, vision, values and goals

To specify what the multigrade teachers and principals should do to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones on the improvement journey, they must:

a. Develop, articulate and communicate the intended change through a shared:

- mission – their purpose for working together as a PLC;
- vision – a clear direction that they want to go towards;
- values – collective commitments; and
- goals – indicated timelines and targets.

IV. Collaborative culture with the focus on learning

To act as a strategic vehicle for getting the work accomplished and for moving the team and their school into the future:

a. The team members work together interdependently to analyse and to impact professional practice in order to improve results for their learners, their team and their school.

V. Collective enquiry into best practice and current reality

To engage and support the members of a PLC in collective enquiry to help them to focus on areas that can contribute to significant improvement:

a. The team members enquire together into best practice for teaching within their context.

b. The team members make a candid clarification of their current practices.

c. The team members make an honest assessment of their current practices.

VI. Action orientation: learning by doing

To provide and serve as the 'fuel' for a PLC to take action in describing the behaviours that are required by an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation:

a. The team members turn their aspirations into action.
b. The team members turn their vision into reality.
c. The team members develop a deeper and more profound knowledge and greater commitment through learning by doing.
d. The team members implement their goals.

VII. Commitment to continuous improvement

To analyse the impact of the changes a PLC has implemented and to apply the new knowledge in the next cycle in order to enhance continuous improvement:

a. The team members gather evidence.
b. The team members develop strategies and ideas.
c. The team members implement the strategies and ideas.
d. The team members analyse the impact of changes/results.
e. The team members apply the new knowledge in the next cycle of continuous improvement.

The above-mentioned guiding principles are grounded in the premise that teachers and principals must work collectively to build a PLC and to achieve this they must create infrastructures, guided by established clear benchmarks of progress and milestones (Figure 3.13 in Chapter 3) in order to interact with one another and to move their PLCs or schools in the intended direction of their improvement journey. These guiding principles, based on clear benchmarks of progress and milestones, ensure that this intervention is built on state-of-the-art knowledge of a PLC (relevance criterion) and that the characteristics are consistently linked (consistency criterion) to one another in the Professional Learning Community Intervention (PLCI) for this research.

5.6 Conclusion

The principles and the guidelines of a PLC provide the support system for multigrade teachers and principals on how to question the governing variables themselves or as a

community, and to change their underlying mental models and decision rules. In the next chapter the Prototyping Phase, comprised of three cycles, will be discussed. The combined design principles and the guidelines from the Preliminary Phase are summarised in Table 5.5, providing an overview of the design principles and guidelines of the first support prototype.

Table 5.5: Overview of the design principles and guidelines of the first support prototype

Professional Learning Community Intervention (PLCI)			
Purpose/Function	**Context**	**Substantive emphasis**	**Procedural emphasis**
Provide ongoing relevant support and guidance to multigrade schools. *Support and guidance that focuses on:* support to all multigrade teachers and principals working together as a network cluster for collective learning and its implementation in a multigrade classroom.	Multigrade schools in South Africa	Multigrade teachers and principals plan and work together in a PLC.	Provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge.
		Supportive and shared leadership.	Build internal capacity for leadership among the team members Share responsibility for leadership amongst the team members. Create a context supportive of change. Provide time for the team to collaborate. Identify critical questions that must guide the work of the collaborative team. Guide the team to create products as a result of their collaboration. Plan and provide resources for the team. Provide the team with relevant data and information. Check the team's progress. Provide continuous assistance to the team and the team members.
		Shared mission, vision, values and goals.	Develop, articulate and communicate the intended change through a shared: mission – their purpose for working together as a PLC; vision – a clear direction that they want to go towards; values - collective commitments; and goals - indicators, timelines and targets.
		Collaborative culture with the focus on learning.	The team members work together interdependently to analyse and impact professional practice in order to improve results for their learners, their team and their school.
		Collective enquiry into best practice and current reality.	The team members enquire together into best practices about teaching for their context. The team members make a candid clarification of their current practices. The team members make an honest assessment of their current practices.
		Action orientation: learning by doing.	The team members turn their aspirations into action. The team members turn their vision into reality. The team members develop a deeper and more profound knowledge and greater commitment by learning by doing. The team members implement their goals.

Professional Learning Community Intervention (PLCI)			
Purpose/Function	**Context**	**Substantive emphasis**	**Procedural emphasis**
		Commitment to continuous improvement.	The team members gather evidence. The team members develop strategies and ideas. The team members implement the strategies and ideas. The team members analyse the impact of changes/results. The team members apply the new knowledge in the next cycle of continuous improvement.

CHAPTER 6

PROTOTYPING PHASE: ESTABLISHING CONDITIONS FOR USE (CYCLE 1-2)

6.1 Introduction

Design research is cyclical and the purpose of each iteration or cycle is to contribute to sharpen the aims and bring the intervention closer to the desired design outcomes and research output (Plomp, 2009:25). In the Preliminary Phase (Chapter 5) the needs and content analysis and the review of literature helped to develop a conceptual or theoretical framework (Chapter 3) for this research and to provide the design principles and guidelines of support for Prototype 1 (PLC). In order to bring this intervention closer to the desired design outcomes and research output, the Prototyping Phase builds on the problem of identification, needs and context analysis in the Preliminary Phase in Chapter 5. Nieveen, McKenney and Van den Akker (2006) describe the Prototyping Stage as the optimising of the prototypes of the intervention through cycles (each being a micro-cycle of research) of design, formative evaluation and revision in order to set out design guidelines.

The design focus of the Prototyping Phase was to establish practical and effective conditions of support and guidance to multigrade teachers and principals, working together as a network cluster for collective learning and its implementation, and then to progress to facilitating the transformation of these practical and effective conditions to the day-to-day user setting of multigrade teachers and principals. Chapter 6 takes a closer look at the research design for and results of the first two of the three design cycles (Figure 4.6 in Chapter 4), employed during the Prototyping Phase. The first and second cycle focused on the pre-existing conditions that needed to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that. The next chapter (Chapter 7) focuses on the third cycle in the Prototyping Phase, examining how to transform these practical and effective conditions of support and guidance to multigrade teachers and principals. The two complete research cycles of this chapter consist of the development of two successive prototypes of a PLC, both of which are formatively evaluated to inform the development of the next prototype. The focus of this chapter is illustrated in Figure 6.1.

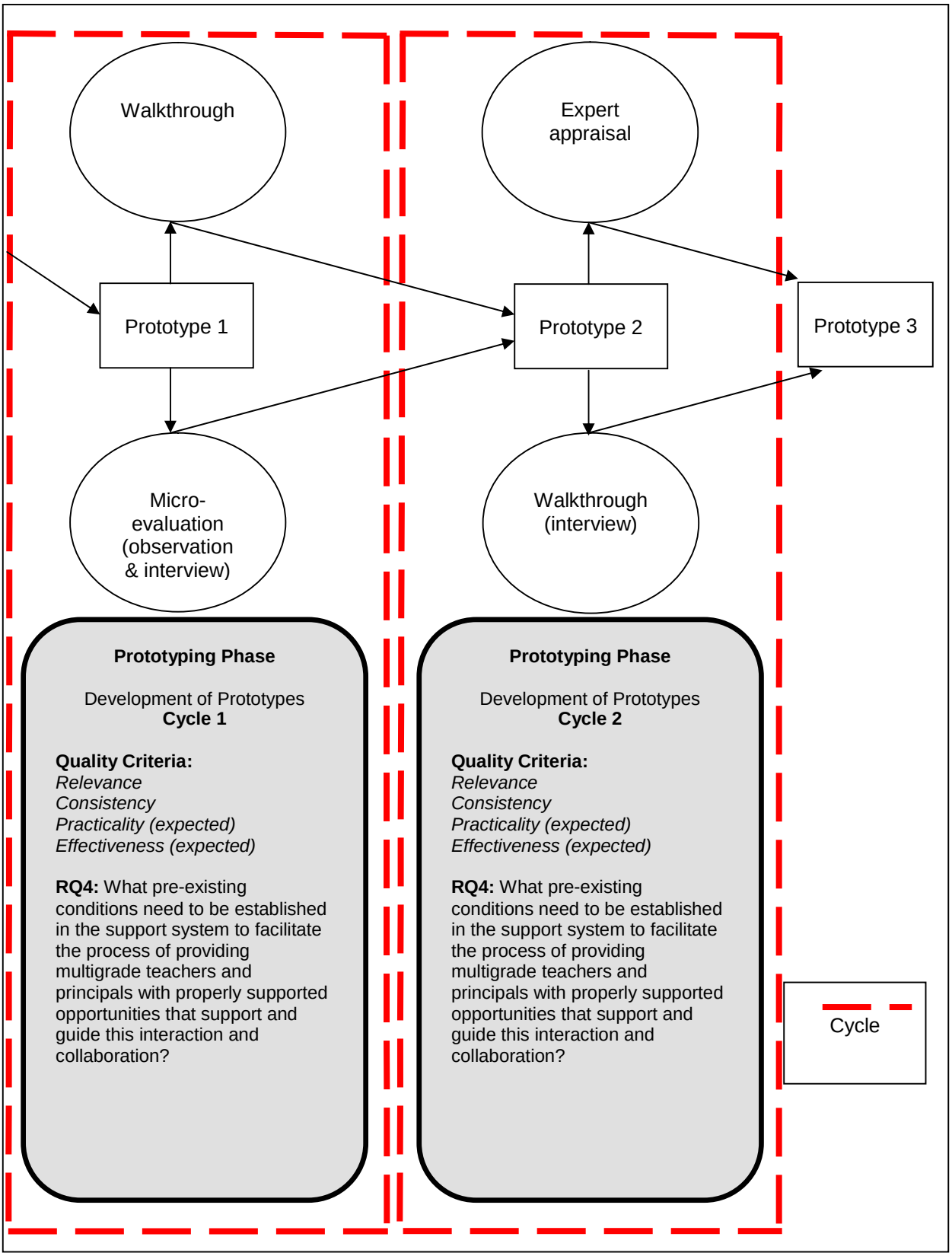


Figure 6.1: Prototyping Phase – Cycle 1 and Cycle 2

In the following sections each of the two cycles of the Prototyping Phase is discussed separately. Section 6.2 discusses Cycle 1 (Prototype 2), beginning with a description of the prototype, followed by a discussion of the research design used to evaluate the prototype.

The evaluation activities are guided by the research questions being addressed and the evaluative focus for the specific cycle. The implementation of Prototype 1 by seven multigrade teachers and principals is discussed in Section 6.2.1. The formative evaluation (Section 6.2.2) of Cycle 1 examines the selection of participants (Section 6.2.2.1), data collection (Section 6.2.2.2), data capturing and analysis (Section 6.2.2.3), results and design guidelines of the observation (Section 6.2.2.4), and results and design guidelines of the interviews (Section 6.2.2.5). This is followed by a discussion (Section 6.2.3).

Section 6.3 discusses Cycle 2 (Prototype 3), beginning with a description of the prototype, followed by a discussion of the research design used to evaluate the prototype. The evaluation activities are guided by the research questions being addressed and the evaluative focus for the specific cycle. The formative evaluation of support Prototype 3 (Section 6.3.1) of Cycle 2 examines the selection of participants (Section 6.3.1.1), data collection (Section 6.3.1.2), data capturing and analysis (Section 6.3.1.3), results and design guidelines of the walkthrough (Section 6.3.1.4), and the results and design guidelines of expert appraisal (Section 6.3.1.5). This is followed by a discussion (Section 6.3.2).

6.2 Cycle 1 (Prototype 2)

Support Prototype 2 incorporated the learning from the Preliminary Phase to establish the conditions to support and guide multigrade teachers and principals working together as a network cluster for collective learning and its implementation in a multigrade classroom. The design and evaluation focus of Cycle 1 focused on establishing the characteristics of a PLC that practically and effectively supported and guided multigrade teachers and principals, working together outside their day-to-day user setting as a network cluster for collective learning and its implementation. While there is a specific focus for this cycle, there is always some deliberate overlap and a cycle may address some aspects of other research questions or evaluative foci.

The formative evaluation for this cycle employed the judgements of seven multigrade teachers and principals, with experience of multigrade education and experience as principals of multigrade schools (Table 4.7 in Chapter 4). The multigrade teachers and principals were asked, as representatives of multigrade education, to use parts of support Prototype 1 outside their day-to-day user setting to determine their practicality and effectiveness. After using parts of support Prototype 1, they were asked to make suggestions for the improvement of support Prototype 1. Open and general evaluation questions were employed during interviews with each of the multigrade teachers and principals, allowing them to make suggestions for the improvement to the global design elements of support Prototype 1.

Cycle 1 addressed the fourth research question:

What pre-existing conditions need to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that support and guide interaction and collaboration? (RQ4)

Cycle 1 served to provide design guidelines relating to the design specifications to establish the practical support and guidance of a PLC to multigrade teachers and principals outside their day-to-day user setting:

Establishing conditions for use – this development stage was aimed at improving the practicality of the characteristics of a PLC, as a support system, by:

- creating a context supportive of change;
- providing time for collaboration;
- identifying critical questions that should guide the work of the collaborative teams;
- developing, articulating and communicating a shared vision of the intended change;
- planning and providing resources;
- investing in professional learning;
- guiding the teams to create products as a result of their collaboration;
- checking the progress;
- providing teams with relevant data and information; and
- providing continuous assistance (InPraxis Group Inc., 2006:29; Hall & Hord, 2011:148).

The evaluation in this cycle focused specifically on the generic criteria (Table 4.3 in Chapter 4) of relevance, consistency and expected practicality (Plomp, 2009), with specific reference to the characteristics of a PLC in providing ongoing relevant support and guidance to multigrade teachers and principals:

- Relevance (content validity): The components of the support system are based on state-of-the- art knowledge and all components of the support system are consistently linked to one another.
- Consistency (construct validity): The intervention is 'logically' designed and all components should be consistently linked to one another. The characteristics of a PLC should act as clear benchmarks of progress and milestones for the multigrade

teachers and principals to interact with one another in order to move their PLC in the intended direction of their improvement journey.

- Expected practicality: The characteristics of the support system are expected to be usable in the settings for which it is designed and developed. Here in particular the focus is on whether the characteristics of a PLC are supporting and guiding multigrade teachers and principals.

In the following section the implementation of support Prototype 1, developed during the Preliminary Phase by the multigrade teachers and principals, is introduced briefly.

6.2.1 Implementation of Prototype 1 by the seven multigrade teachers and principals

The purpose of the inclusion of the multigrade teachers and principals, who were part of a project for a year at the CMGE, and functioning as a PLC, was to construct a manual for multigrade principals in South Africa. The aim of the manual was to provide organisational and management support to multigrade principals in six identified areas, predetermined in the MGRSI (Table 5.1 in Chapter 5), namely:

- learning spaces and classroom organisation;
- classroom routines and discipline;
- curriculum structuring and planning;
- teaching strategies;
- self-directed strategies; and
- peer tutoring.

It was the multigrade teachers' and principals' first time functioning as a PLC and the CMGE envisaged the opportunity to identify and establish conditions supporting and guiding multigrade teachers and principals in multigrade schools, functioning as a PLC. The data (Table 2.9 in Chapter 2 and Section 5.3.4 in Chapter 5) made it clear that although to a certain degree PLC practices (based on the five dimensions of a professional learning community) did occur in multigrade schools and that teachers and principals did recognise the advantages of working together, network clustering was experienced as problematic for multigrade teachers and principals because when they came together as cluster groups they were not clear about how they could support one another. For some of them, opportunities and structures for collective learning through open dialogue also did not exist.

Based on the above-mentioned challenges, the fact that the multigrade teachers and principals had little or no knowledge of functioning as a PLC and that no 'how-to-do'

guidelines for multigrade education in South Africa existed, the CMGE made a decision to include a researcher as a member of the group of multigrade teachers and principals. As a member of the group, the researcher would be part of the planning, acting and reflecting to transform the design principles and guidelines of the support Prototype to a multigrade context. Allowing the researcher as a participant-as-observer (Section 4.5 in Chapter 4) to be part of the group gave the researcher the opportunity:

- to be part of the world of the multigrade teachers and principals and to be afforded the opportunity to gather 'live' data from 'live' situations;
- to investigate the world of the multigrade teachers and principals and to support collective reflection by including all of the participants, as part of the design research team, in the process of planning, acting, observing and reflecting to achieve change;
- to experience and explicitly recognise the problems of the teachers and principals in their day-to-day user-setting; and
- to develop prototype solutions, informed by state-of-art theory, existing design principles and technology innovations.

A walkthrough was used as the first step to introduce support Prototype 1 to the multigrade teachers and principals, who formed part of the design research team, in the process of planning, acting and reflecting on adaptation of the design principles and guidelines. During the walkthrough process the multigrade teachers and principals (n = 7) were invited to check their working together as a group, using the design principles and guidelines of the support Prototype 1 (Section 5.5 in Chapter 5) as a checklist of required characteristics and guidelines for functioning as a PLC.

After the walkthrough, the multigrade teachers and principals used the required characteristics and guidelines for functioning as a PLC of Prototype 1, and adapted the purpose/function and context of Prototype 1 to suit their purpose (Table 6.1) and context. The characteristics (substantive emphasis) and procedures (procedural emphasis) of the design principles and guidelines of support Prototype 1 stayed the same. The multigrade teachers and principals were then asked to apply the design principles and guidelines of the support Prototype 1 for a year in a micro-evaluation.

Table 6.1: Transformed design principles and guidelines of support Prototype 1 to address the unique needs and situation of the seven multigrade teachers and principals

Professional Learning Community Intervention (PLCI) for the seven multigrade teachers and principals			
Purpose/Function	**Context**	**Substantive emphasis**	**Procedural emphasis**
Provide ongoing relevant support and guidance to seven multigrade teachers and principals, working together as a PLC. *Support and guidance that focused on ...* Creating a context supportive of change. Providing time for collaboration. Identifying critical questions that must guide the work of the collaborative teams. Developing, articulating and communicating a shared vision of the intended change. Planning and providing resources. Investing in professional learning. Guiding the teams to create products as a result of their collaboration. Checking the progress. Providing teams with relevant data and information. Providing continuous assistance. *... in constructing a* manual for multigrade principals in South Africa, providing organisational and management support to multigrade principals in six identified areas.	Establish the use of a support system (PLC) for multigrade teachers and principals to use outside their day-to-day user setting.	Multigrade role-players plan and work together in a PLC.	Provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge.
		Supportive and shared leadership.	Building internal capacity for leadership is necessary among the team members. Share responsibility for leadership among the team members. Create a context supportive of change. Provide time for the team to collaborate. Identify critical questions that must guide the work of the collaborative team. Guide the team to create products as a result of their collaboration. Plan and provide resources for the team. Provide the team with relevant data and information. Check the team's progress. Provide continuous assistance to the team and the team members.
		Shared mission, vision, values and goals.	Develop, articulate and communicate the intended change through a shared: mission – their purpose for working together as a PLC; vision – a clear direction that they want to go; values – collective commitments; and goals – indicators, timelines and targets.
		Collaborative culture with the focus on learning	The team members work together interdependently to analyse and to impact professional practice in order to improve results for their learners, their team and their school.
		Collective enquiry into best practice and current reality.	The team members investigate together into best practices about teaching for their context. The team members make a candid clarification of their current practices. The team members make an honest assessment of their current practices.
		Action orientation: learning by doing.	The team members turn their aspirations into action. The team members turn their vision into reality. The team members develop a deeper and more profound knowledge and greater commitment by learning by doing. The team members implement their goals.
		Commitment to continuous improvement.	The team members gather evidence. The team members develop strategies and ideas. The team members implement the strategies and ideas. The team members analyse the impact of changes/results. The team members apply the new knowledge in the next cycle of continuous improvement.

During the micro-evaluation the multigrade teachers and principals (n = 7) were given the opportunity to use parts of support Prototype 1 outside their day-to-day user setting in order to, as part of the design research team, assess the design principles and guidelines of support Prototype 1 to ensure that:

- all components of the support system were consistently linked to one another in order to provide support and guidance to multigrade teachers and principals; and
- the characteristics of the support system could be used by multigrade teachers and principals in a specific situation and context.

6.2.2 Formative evaluation of Prototype 2

The formative evaluation of Prototype 2 took place through two processes. Firstly, the multigrade teachers and principals were invited to check the characteristics of a PLC, during a process of a walkthrough and using the design principles and guidelines of support Prototype 1 as a checklist, to provide suggestions and priorities for improvement of support Prototype 2. Secondly, the seven multigrade teachers and principals were asked to implement and evaluate the design principles and guidelines of the support Prototype 1 in a micro-evaluation and to provide verbal feedback during interviews. The research procedures for this formative evaluation are discussed below.

6.2.2.1 Selection of participants

Seven multigrade teachers and principals were invited to function as a group (PLC) to construct a manual for multigrade principals in South Africa. The samples came from multigrade teachers, with experience of multigrade education and experience as principals of multigrade schools (Table 4.7 in Chapter 4) from (Table 4.8 in Chapter 4), and comprised:

- a two-man staffed multigrade school;
- a three-man staffed multigrade school;
- a four-man staffed multigrade school; and
- a five-man staffed multigrade school,

in the Overberg Education District (two), West Coast Education District (three) and the Winelands Education District (two) (Table 4.8 in Chapter 4).

6.2.2.2 Data collection

The input from the multigrade teachers and principals during the walkthrough was less formal. The seven multigrade teachers and principals provided verbal comments during the

first workshop and made recommendations for adapting the design principles and guidelines of support Prototype 1 to be used by them.

The data collection for the micro-evaluation took place through two processes to ensure the validity of the data collected (Cohen *et al.*, 2000:121). Firstly, during the micro-evaluation, naturalistic observation was used to afford the researcher the opportunity to gather 'live' data from 'live' situations and to be given the opportunity to look at what was taking place *in situ* (place in a particular location or context) rather than at second-hand. The role of participant-as-observer allowed the researcher to be a member of the group being studied. The group was aware of the research activity. Secondly, a standardised open-ended interview was conducted at the end of the micro-evaluation with each of the participants to allow them to discuss their interpretations of functioning as a PLC and to express how they regarded the situation from their own point of view (Cohen *et al*., 2000:267, 305).

6.2.2.3 Data capturing and analysis

Audio-visual recordings were used to capture the data during the walkthrough and observation. For the interviews, standardised open-ended interviews were used to ensure that the exact wording and sequence of questioning could be determined in advance, that all the interviewees were asked the same basic questions in the same order, and to control the reliability of the interviews and the data captured (Cohen *et al.*, 2000:121). To further ensure the validity of the interviews and to minimise (Cohen *et al.*, 2000:121):

- the attitudes, opinions and expectations of the researcher;
- a tendency of the researcher to see the respondent in his own image;
- a tendency of the researcher to seek answers that support his preconceived notions; and
- misperceptions on the part of the researcher of what the respondents were saying,

a researcher from the CMGE was used, after the micro-evaluation, to conduct the interviews. By using another researcher (known to the multigrade teachers and principals, but not part of this research), it minimised the error of data collection during interviews of (Mouton, 2001:107):

- socially desirable effects, where the interviewee may be saying what he/she feels he/she 'should' believe or what he/she feels will please the interviewer, rather than what he/she actually believes;

- evaluation apprehension, where the interviewee may be trying to impress the researcher who is interviewing him/her; and
- demand characteristics, where the interviewee may be producing responses that he/she thinks the researcher wants to hear.

The researcher of the CMGE used a digital voice recorder to record each interview. The observations from the meetings of the micro-evaluation were captured through field notes, according to a checklist (Table 6.2) of the content of field notes.

Table 6.2: Checklist of the content of field notes of Spradley (1980)

Checklist of the content of field notes		
Space	–	the physical setting.
Actors	–	the people in the situation.
Activities	–	the set of related acts that is taking place.
Objects	–	the artefacts and physical things that are there.
Acts	–	the specific actions that participants are doing.
Events	–	the set of activities that is taking place.
Time	–	the sequence of acts, activities and events.
Goals	–	what people are trying to achieve.
Feelings	–	what people feel and how they express this.

The data from the interviews was captured textually to generate themes of suggestions and priorities for improvement in order to transform and to use the design principles and guidelines. These themes were compared with input from the field notes of the researcher to determine which aspects should receive priority for further development. This process allowed for the grounding of the design principles and guidelines of support Prototype 1 in the context of multigrade teachers and principals.

6.2.2.4 Results and design guidelines – observation

The overall observation of the multigrade teachers and principals, functioning as a PLC by using the design principles and guidelines of support Prototype 1, was positive. The observation helped to expose the strengths and the weaknesses of adapting the design principles and guidelines of support Prototype 1 to be used by multigrade teachers and principals outside their day-to-day user setting and provided valuable data for further improvement of the support Prototype.

During the observation it became clear that the design principles and guidelines of support Prototype 1:

1. on paper:
    - are clear and in an easily understandable format for multigrade teachers and principals to read and understand;

- provide a clear and an easily understandable description of how the platform, to deliberately plan and work together, functions; and
- are consistently linked to one another and act as clear benchmarks of progress and milestones for multigrade teachers and principals to see and to understand how they must move their PLC in the intended direction of their improvement journey.

2. in adapting them from paper to actually using them:
   - it is easy to adapt and to start working with the design principles and guidelines if the person leading a PLC or adapting the design principles and guidelines is knowledgeable, experienced and trained in working with the design principles of a PLC.
3. working with them:
   - it is easy to work with one design principle and then to move to the next design principle, as clear benchmarks of progress and milestones, if the person leading a PLC is knowledgeable, experienced and trained in working with the design principles and guidelines of a PLC.

During the observation it also became clear that in order to ensure support and guidance to multigrade teachers and principals, and in allowing them to function as a PLC, the design principles and guidelines of support Prototype 1 should be improved:

1. on paper:
   - although the design principles and guidelines are clear and in an easily understandable format for them to read and understand, the design principles and guidelines should already be adapted for actual use by the multigrade teachers and principals and must be available in a practicable and workable format.
2. when working with them:
   - multigrade role-players plan and work together in a PLC
     - ➢ that the knowledge and skills that multigrade teachers and principals receive during the training should be sufficient for them to function as a PLC on its own for a period of time without the help of an external source;
     - ➢ that the knowledge and skills that multigrade teachers and principals receive during the training should be sufficient to empower each member of a PLC in

order for him/her to understand his/her specific role in a PLC and what is expected of each;

- the practical and working format of the design principles and guidelines should be sufficient for a PLC to function on its own for a period of time without the help of an external source;
- supportive and shared leadership – all members of a PLC, owing to the factors observed that hampered supported and shared leadership (Table 6.3), should first be trained as potential leaders in leading a PLC, in order for them to understand the whole process;
- shared mission, vision, values and goals – the members should be guided how to transfer their discussions onto paper to ensure that the indicators, timelines and targets are visible and available to all the members at any time in order for them to know:
  - ✓ what they must do;
  - ✓ when they must do it;
  - ✓ who must do it;
  - ✓ how they must do it; and
  - ✓ what proof they must present to show that they have used or implemented it in the classroom.

- action orientation: learning by doing – the 'what they must do' should first be demonstrated to them in order for the members to see the 'what they must do' and learn from the demonstration before they try it in the classrooms.

Table 6.3: Factors that hampered supported and shared leadership during Cycle 1 of the Prototyping Phase

- Only one of the multigrade teachers and principals tried or was prepared to share the leadership in supporting and guiding the PLC through six steps in order to create a product.
- The multigrade teachers and principals viewed shared leadership as the time when a member of a PLC was talking to the group.
- In delivering a product through learning by doing (design principle – action orientation: learning by doing), some of the multigrade teachers and principals:
  - started to stay away from meetings;
  - did not do their share of the work; and
  - if they missed the due date for handing in their share of the work, made no effort to hand it in at a later stage.

6.2.2.5 Results and design guidelines – interviews

The interviews helped to compare the data collected from the observation and provided valuable data for the further improvement of the design principles and guidelines of support Prototype 1. During the interviews it became clear that the multigrade teachers and principals generally expressed the view that functioning as a PLC was a very informative, positive and a good experience:

"For me it was a forum, a place where we shared everything with each other. I was very negative with the previous intervention, but co-operation in a PLC changed my beliefs in the fact that certain things were the only solution for operating in a multigrade classroom, but I was not sure how to apply it. I have gained a new insight with respect to multigrade education" (Participant 1).

"It had been a good experience for me. A PLC like I had experienced, … is a necessity for multigrade schools and there is definitely a need for it. I found it very enjoyable and informative. Not just for me as a teacher, but also as a person" (Participant 2).

"I learned a lot from the other principals" (Participant 3).

"It was a very good experience – personally and academically it broadened my vision" (Participant 4).

"Last year was a fantastic year. Especially the trip overseas had opened the world to me. We were a good group" (Participant 7).

The following priorities for improvement of the design principles and guidelines of support Prototype 1, based on data obtained from the interviews, were identified:

1. Multigrade role-players plan and work together in a PLC

   The multigrade teachers and principals agreed that during the time that they came together they worked well together but not all of them knew what to do to take the process further or what to do when they were finished with the meetings.

   "Yes, the programme every day allowed for reflection, talking together in a group and gave us opportunities to do it" (Participant 4).

   "Yes, to an extent during the time we were together. Everyone talked about their school. Guidance should be there to take process forward" (Participant 7).

   "Yes, only during the meetings at CMGE. It was not sustainable outside our meetings" (Participant 1).

2. Supportive and shared leadership

   The multigrade teachers and principals agreed that this design principle allowed for supportive and shared leadership, but only one of them tried to share the leadership. With regard to shared leadership, it also became evident during the interviews that some of the multigrade teachers and principals viewed shared leadership as just the time when someone from a PLC was talking to the group.

   "Yes, when we talked about parental involvement. So we supported them with knowledge" (Participant 1).

   "Yes, we helped each other. Discussions helped if someone did not know something" (Participant 6).

   "Yes, the researcher was the leader. I tried to share the leadership during the overseas visit" (Participant 4).

   "I see leadership as the one doing the talking" (Participant 1).

   "Yes, when we talked during the feedback sessions" (Participant 5).

   "No dominant leader. Most of us had a chance to talk and then the others listened" (Participant 6).

3. Shared mission, vision, values and goals

   The multigrade teachers and principals agreed that this design principle allowed a PLC to specify what they should do to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones, but not all of them were always certain what they should do and how to do it.

   "Yes, we worked according to criteria and everyone did the same work" (Participant 4).

   "We were uncertain what to do" (Participant 1).

   "Some of the principals did not attend the last few sessions. All of us did not know how to do it" (Participant 6).

4. Action orientation: learning by doing

   The multigrade teachers and principals agreed that this design principle allowed them to take action to carry out or perform what they had to do, but some of them felt that they first wanted to see a demonstration before they took action to try it or implement it in a classroom.

"I saw too little [of] how it should be done. I saw photos, but I wanted to see and experience it. The demonstrations were too few" (Participant 1).

"Yes, we heard more about what we had to do and then they showed us examples. We talked about it, but we saw no demonstrations" (Participant 2).

"No, we did not do it practically" (Participant 7).

6.2.3 Discussion

The design and formative evaluation of support Prototype 1 led to some first insights into the practicality of support Prototype 1, supporting and guiding multigrade teachers and principals working together outside their day-to-day user setting as a network cluster for collective learning and its implementation. Although the participants were rather positive about using the design principles and guidelines of support Prototype 1, the CMGE members were somewhat concerned that:

- the participants were depending too much on the guidance and support of the researcher (participant-as-observer) in moving the functioning of a PLC in the intended direction, guided by established clear benchmarks of progress and milestones;
- only one participant tried to share the leadership; and
- not all of the participants knew what to do to take the process further or what to do when they were finished with the meetings.

This led to the decision that support Prototype 1 needed to anticipate these recommendations and concerns by adapting the design principles and guidelines to a clear and easily understandable and workable format for actual use by the multigrade teachers and principals. For the researcher just to anticipate these recommendations and concerns in adapting the design principles and guidelines to a clear and easily understandable and workable format, ready for multigrade teachers and principals to use in their schools, was viewed as a potential problem. For this reason, the actual implementation of these ideas in support Prototype 1 started with the design of a paper-based prototype of support Prototype 2 first. This was a paper-based prototype that was relatively easy to produce and to change in the early design stages, when many design decisions were still open (Rettig, 1994).

Paper-based support Prototype 2 was designed to explain ways in which multigrade teachers and principals, when using support Prototype 2, would be supported and be guided to see what they had to do to function as a PLC. The paper-based prototype consisted of four pages (Appendix D) representing the functioning of a PLC and participants could first 'walk through' the design guidelines of support Prototype 2 on paper to guide them in what they had to do to

function as a PLC. The characteristics of a PLC were illustrated graphically (Figure 6.2) to guide the multigrade teachers and principals to see the process of support and guidance to move from point A (multigrade teachers and principals as active participants involved in their own learning) to point B (collective learning and its implementation in a classroom). The graphic illustration of the design principles and guidelines was followed with a workable format (Figure 6.3) of each design principle and guideline of support Prototype 2 separately on paper, explaining the support indicator and guidelines of each design principle.

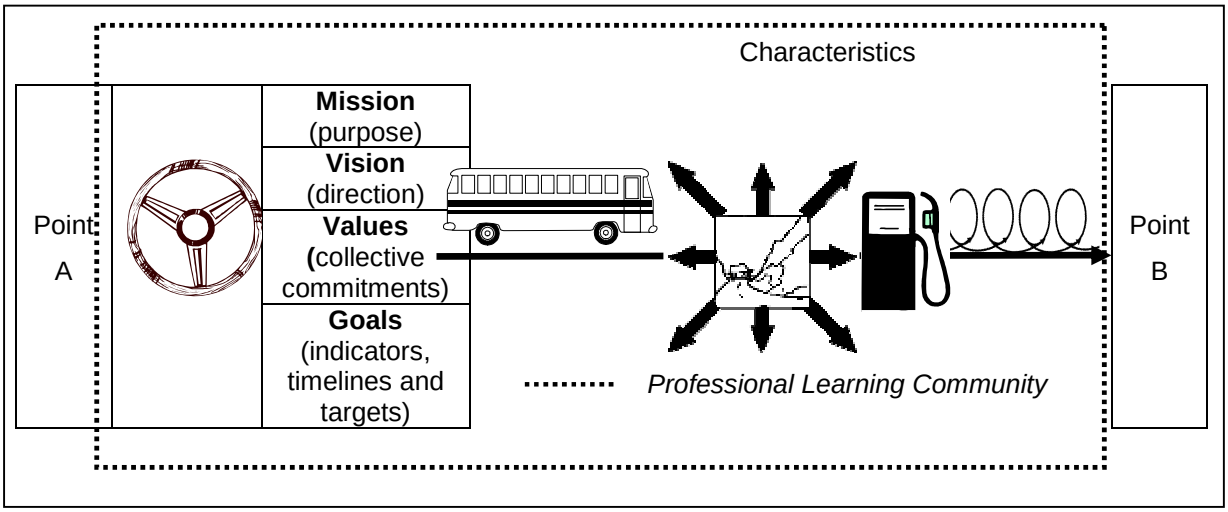


Figure 6.2: Graphic illustration of design principles and guidelines of paper-based support Prototype 2

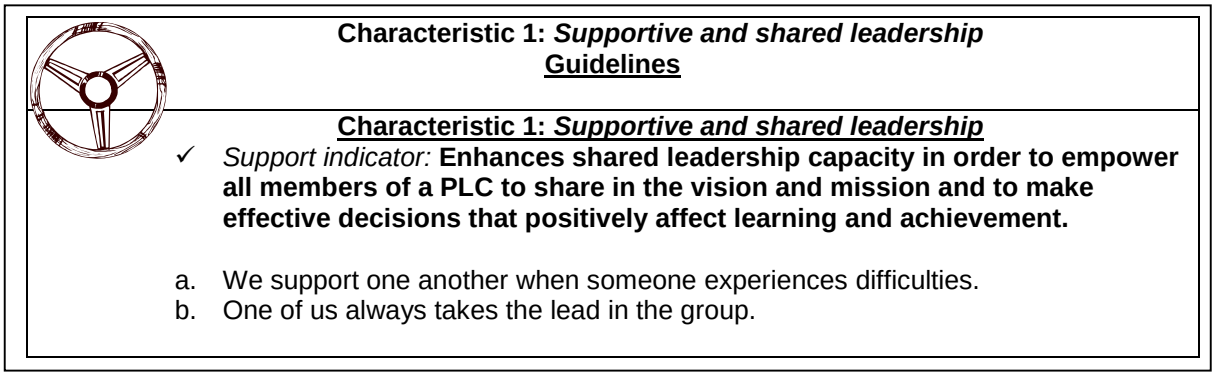


Figure 6.3: An understandable and workable format of a design principle and guideline of support Prototype 2

The design principles of support Prototype 2 stayed the same as the design principles for support Prototype 1. Only minor changes were made to the design guidelines (procedures) (Table 6.1) of support Prototype 1 to ensure that:

- the knowledge and skills received during the training are sufficient enough to empower each member of a PLC in order for him/her to understand his/her specific role in a PLC and what is expected of each of them;

- the design principles and guidelines are available in a practical and workable format for the multigrade teachers and principals to use in their schools;
- the practical and working format of the design principles and guidelines are sufficient enough for a PLC to function on its own for a period of time without the help of an external source;
- all members are trained as potential leaders;
- the indicators, timelines and targets are visible and available on paper to all the members at any time; and
- what must be done is first demonstrated in order for the members to see what they should do and learn from this demonstration before they attempt in the classrooms.

These changes were essential to ensure the design principles and guidelines of support Prototype 2 practically support and guide multigrade teachers and principals working together outside their day-to-day user setting as a network cluster for collective learning and its implementation. The combined design principles and guidelines from Cycle 1 of the Prototyping Phase are summarised in Table 6.4, providing an overview of the design principles and guidelines of support Prototype 2.

Table 6.4: Overview of the design principles and guidelines of support Prototype 2

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
Provide ongoing relevant support and guidance to multigrade schools. *Support and guidance that focused on*: support to all multigrade teachers and principals working together as a network cluster for collective learning and its implementation in multigrade classrooms.	Multigrade teachers and principals plan and work together in a PLC.	Provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge. A PLC must be able to work and plan for a period of time without the help of an external source. The knowledge and skills received during the training must be sufficient to empower each member of the PLC in order for him/her to understand his/her specific role in a PLC and what is expected of each of them. The design principles and guidelines should already be adapted for actual use by the multigrade teachers and principals and be available in a practical and workable format. The practical and working format of the design principles and guidelines should be sufficient for a PLC to function on its own for a period of time without the help of an external source.
	Supportive and shared leadership.	Building internal capacity for leadership is necessary among the team members. Share responsibility for leadership among the team members. Create a context supportive of change. Provide time for the team to collaborate. Identify critical questions that must guide the work of the collaborative team. Guide the team to create products as a result of their collaboration. Plan and provide resources for the team. Provide the team with relevant data and information. Check the team's progress. Provide continuous assistance to the team and the team members. All members must be trained as potential leaders.

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
	Shared mission, vision, values and goals.	Develop, articulate and communicate the intended change through a shared: mission – their purpose for working together as a PLC; vision – a clear direction that they want to go; values – collective commitments; and goals – indicators, timelines and targets. Indicators, timelines and targets should be visible and available on paper to all the members at any time.
	Collaborative culture with the focus on learning.	The team members work together interdependently to analyse and to impact professional practice in order to improve results for their learners, their team and their school.
	Collective enquiry into best practice and current reality.	The team members enquire together into best practices about teaching for their context. The team members make a candid clarification of their current practices. The team members make an honest assessment of their current practices.
	Action orientation: learning by doing.	The team members turn their aspirations into action. The team members turn their vision into reality. The team members develop a deeper and more profound knowledge and greater commitment through learning by doing. The team members implement their goals. Demonstrate what must be done in order for the members to see what they must do and learn from this demonstration before they attempt it in the classrooms.
	Commitment to continuous improvement.	The team members gather evidence. The team members develop strategies and ideas. The team members implement the strategies and ideas. The team members analyse the impact of changes/results. The team members apply the new knowledge in the next cycle of continuous improvement.

6.3 Cycle 2 (Prototype 3)

The aim of the first two cycles of the Prototyping Phase was to establish practical and effective conditions supporting and guiding multigrade teachers and principals, working together as a network cluster. The first cycle focused on conditions outside their day-to-day user setting and the second cycle focused on conditions in their day-to-day user setting. Therefore, support Prototype 3 incorporated the learning from Cycle 1 of the Prototyping Phase to further establish the conditions to support and guide multigrade teachers and principals, working together in their day-to-day user setting as a network cluster for collective learning and its implementation. While there is a specific focus for this cycle, there is always some deliberate overlap and a cycle may address some aspects of other research questions or evaluative foci.

The formative evaluation of support Prototype 3 was more directly focused on the expected practicality and effectiveness of the design principles and guidelines. The guiding research and evaluation question for Cycle 3 therefore still focused on practicality and effectiveness,

but with a focus on expected practical and effective support and guidance to multigrade teachers and principals.

Cycle 2 addressed the fourth research question:

What pre-existing conditions need to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that support and guide the interaction and collaboration? (RQ4)

The design principles and guidelines generated related specifications to establish the expected practicality and effectiveness of the characteristics of a PLC in supporting and guiding multigrade teachers and principals working together:

Establishing conditions for use: This development stage was aimed at improving the practicality and effectiveness of the characteristics of a PLC in supporting and guiding multigrade teachers and principals working together in their day-to-day user setting. The evaluation in this cycle focused specifically on the generic criteria (Table 4.3 in Chapter 4) of validity, practicality and effectiveness, with specific reference to the characteristics of a PLC in providing ongoing relevant support and guidance to multigrade teachers and principals:

- Relevance (content validity): The components of the support system are based on state-of-the-art knowledge and all components of the support system are consistently linked to one another in order to provide support and guidance to multigrade teachers and principals.
- Consistency (construct validity): The intervention is 'logically' designed and all components should be consistently linked to one another. The characteristics of a PLC should act as clear benchmarks of progress and milestones in order for the multigrade teachers and principals to interact with each other in order to move their PLC in the intended direction of their improvement journey.
- Practicality (expected): The characteristics of the support system are expected to be usable in the settings for which it is designed and developed. Here in particular the focus is on whether the characteristics of a PLC support and guide multigrade teachers and principals.
- Effectiveness (expected): Refers to the concept that it should be possible to realise developers' intentions for the multigrade teachers and principals under normal conditions.

6.3.1 Formative evaluation of support Prototype 3

Experts of multigrade education were asked to evaluate support Prototype 2. The multigrade teachers and principals did a 'walkthrough' (a few representatives of the target group went through the set-up of the intervention) and the experts did an appraisal (a group of experts commented on a prototype of the intervention) (Nieveen, 2009:95-96).

The research procedures for the formative evaluation of support Prototype 3 are discussed below.

6.3.1.1 Selection of participants

The seven multigrade teachers and principals (Section 6.2.2.1) were retained for the follow-up assessment and were used to do the 'walkthrough'. Three experts in the field of multigrade education, with experience of professional development of teachers, Professional Learning Communities and multigrade education (Table 4.10) in South Africa, were used to conduct an appraisal of support Prototype 2.

6.3.1.2 Data collection

Walkthrough by multigrade teachers and principals

During the evaluation, the multigrade teachers and principals (n = 7) 'walked through' the paper-based support Prototype 2 by going from one paper characteristic to another. To guide their movements, two scenarios were given to the multigrade teachers and principals. In all scenarios, the context was kept the same: it concerned the situation in which developers would like to perform a formative evaluation of the practicality of the characteristics of a PLC. The focus of the evaluation would be on the practicality of the characteristics.

In the first scenario, the multigrade teachers and principals started at the beginning of the prototype, illustrated graphically (Figure 6.2), to guide them to see the process, supporting and guiding them to be active participants in the process and to help them to move from point A (multigrade teachers and principals as active participants involved in their own learning) to point B (collective learning and its implementation in a classroom). This created an impression of the characteristics of a PLC, which they would see when they were using support Prototype 2 laterally. In the second scenario the participants started with the workable format (Figure 6.3) of each design principle of support Prototype 2 separately on paper, explaining the support indicator and guidelines of each design principle. To ensure that the same questions concerning the paper-based prototype would be answered by all participants, the interviewer used a predetermined list of questions for each interview.

Expert appraisal

The three experts (n = 3) in the field of curriculum development, professional development of teachers, and experience in Professional Learning Communities and multigrade education, received a copy, separately on paper, of the graphically illustrated characteristics of a PLC and a workable format (Figure 6.3) of each design principle of support Prototype 2, explaining the support indicator and guidelines of each design principle. They commented on the correctness, internal consistency and effectiveness of support Prototype 2. To ensure that the same questions concerning the paper-based prototype would be answered by all the experts, the same predetermined list of questions was sent to each expert.

6.3.1.3 Data capturing and analysis

The researcher from the CMGE, who conducted the interviews after the micro-evaluation (Section 6.2.2.3), also conducted and captured the data of the walkthrough. The researcher used a digital voice recorder to record each interview. The data from the walkthrough were captured textually to generate themes of suggestions, according to usefulness and comprehensibility, and priorities for improvement, in order to transform and to use the design principles and guidelines.

These themes were compared with the input from the expert appraisal to determine which aspects should receive priority for further development. The data from the expert appraisal were also captured textually to generate themes of suggestions, according to correctness, internal consistency and effectiveness, and priorities for improvement in order to transform and to use the design principles and guidelines.

6.3.1.4 Results and design guidelines – walkthrough

Overall the multigrade teachers and principals were happy with the expected practicality of the design principles (characteristics) and guidelines of the paper-based support Prototype 2 in supporting and guiding them as multigrade teachers and principals. During the walkthrough, although it was not the main purpose of the formative evaluation of the walkthrough, most comments were requests for more specifics to the guidelines of the design principles of support Prototype 2 workable paper-based format, such as:

on the workable paper-based format of support Prototype 3:

Supportive and shared leadership

For a first-time participant to be able to share the leadership or take the lead in the real user setting, the person must know the stages very well in order to guide the group through the various stages.

Guidelines:

- The person should know the stages very well.
- The person must guide the group through the various steps.

  "The person taking the lead must know the stages very well and must lead the group through the various stages" (Participant 6).

In order to improve supportive leadership the members should know that loyalty and trust between members play an important role for supportive and shared leadership to work in the real user setting.

Guidelines:

- We trust each other and we are loyal to each other.

  "Yes, loyalty and trust is very important when we support each other" (Participant 5).

A collaborative culture with the focus on learning

To avoid that the personality of an individual dominate the collaboration, there should be a spirit of listening to each other in order to see how they can improve their current teaching in their classrooms.

Guidelines:

- There is a spirit of listening to each other to see how we can improve our current teaching in our classrooms.

  "There must be a spirit of listening to each other to see how we can improve our current teaching in our classrooms and the personality of an individual should not dominate the group" (Participant 1).

Because these comments were considered to be important to improve the workable paper-based support Prototype 2, it was decided to include these comments in support Prototype 3.

The multigrade teachers and principals appreciated the expected practicality of the characteristics of the paper-based support Prototype 2 in supporting and guiding them as multigrade teachers and principals. The following request was made with respect to improving the expected practicality of the characteristics:

when working with support Prototype 2:

> Shared mission, vision, values and goals
>
> In order for the group to continually check and revise their progress and to provide support to the members, a checklist should be available for them to reflect on before, during and after the intervention.
>
> Guidelines:
>
> - A checklist should be available to continually revise progress and to provide support.
>
> "During revision we need a checklist when something is not right or at the end so we can do it again" (Participant 7).
>
> "We must support each other every now and again to evaluate:
>
> Does it work?
>
> What did we learn?
>
> Is there something that we are struggling with?
>
> How can we solve this?" (Participant 1).

It was decided that because of the request for a checklist, the design principle, shared mission, vision, values and goals, should be further adapted, as part of the workable paper-based support prototype format, as a template (Figure 6.4). Multigrade teachers and principals can then use the template, by completing the proposed questions on the template, before, during and after the intervention, to continually check and revise their progress and to provide support and guidance to the members.

<table>
<tr><td><u>Our purpose</u>: Our group has a definite goal why we get together.</td><td colspan="4">Write it down!</td></tr>
<tr><td><u>A clear direction</u>: We know what our group wants to achieve.</td><td colspan="4">Write it down!</td></tr>
<tr><td rowspan="2">We know what we must do.

Write it down!</td><td rowspan="2">We know how we must do it.

Write it down!</td><td rowspan="2">We know who must do it.

Write it down!</td><td rowspan="2">We know when to do it.

Write it down!</td><td>We know what proof we will present to show that we have used or implemented it in the classroom.
Write it down!</td></tr>
<tr><td>Was it effective?

Does it work?
What did we learn?
Is there something that we are struggling with?
How can we solve this?
Write it down!</td></tr>
</table>

Figure 6.4: Shared mission, vision, values and goals adapted as a template

6.3.1.5 Results and design guidelines – expert appraisal

It appeared that the experts were positive that all the components of the support Prototype 2 (PLC) were consistently linked to one another with the specific intention to provide support and guidance (as clear benchmarks of progress and milestones in order for the multigrade teachers and principals to interact with each other) to multigrade teachers and principals. Most comments from the experts were requests for more specifics on improving the effectiveness of workable paper-based support Prototype 2, such as:

1. Multigrade role-players plan and work together in a PLC

   The graphic illustration of the design guidelines needs more information clarity and the input focus (Figure 3.12 in Chapter 3) of the PLC should also ensure that the needs of the multigrade teachers and principals are included.

   "The graphic illustration of the design guidelines needs information clarity. Provide more meat to figure" (Expert 3).

   "Focus on teachers' input only and not PLC's input – flows both ways. Limitation can be that it focuses only on a PLC input, thus the teacher's input, where it is most needed, is lost" (Expert 3).

For a first-time participant to be able to use workable paper-based support Prototype 2, the prototype will have to cater for an apathetic, Third-World, illiterate and divided 'community'. If not it will be difficult to follow the guide.

"Education is evolutionary –buy-in is important. In sociology/ideology terms the guidelines and models will deal with an apathetic, Third World, illiterate and divided 'community'. This will make following the guide difficult" (Expert 3).

2. A collaborative culture with the focus on learning

   In order for the design principles and guidelines to be effective and to avoid a misconception that multigrade exists as a process, the design principles and guidelines need multigrade content to foster the existence of multigrade as a structure.

   "Multigrade exits as a structure, not as a practice. Your guidelines need more content to provide certainty and ensure compliance" (Expert 3).

3. Collective enquiry into best practice and current reality

   In order to make an effective and honest assessment of the multigrade teachers' and principals' learning, to move beyond discussion, and to focus on areas that can contribute to significant improvement, a 'hermeneutical' interpretation must be avoided by rather focusing on observation and the practical commitment to change of the multigrade teachers and principals.

   "An honest assessment of the teachers' and principals' learning, to move beyond discussion, is difficult to quantify or even qualify. Avoid a 'hermeneutical' interpretation of indicator 3 in the teachers' response. Rather focus here on 'observation' and the practical commitment to change of the teacher" (Expert 2).

   To make collective enquiry into best practice and current reality easier and more effective for the participants, easy practical steps must drive the process.

   "In the end the researcher will be the voice on best practice and 'reality' or 'ontology' – it's not easy since a number of views exit. Teachers themselves do not have clarity, but need guidelines and surety. As a process it needs to be driven" (Expert 3).

   "Remember that we have tried to 'create' MG teachers for some time now. One of the problems is resistance to change or to sustain the transformation. The 'how' should

include easy practical steps. The guidelines must help to structure the process" (Expert 3).

4. Action orientation: learning by doing

   It must be clear what the multigrade teachers and principals should do to be active during the process of learning by doing.

   "What is not clear is the process of 'how to be active' participants in the multigrade classroom. In short, yes it can support, but link it more to the teacher" (Expert 2).

   "Indicate some actions in tables" (Expert 3).

5. Commitment to continuous improvement

   Because this is a model of doing and to ensure the effectiveness of a guideline, when used over and over to ensure the same results every time, the analytical and application skills of teachers should be strengthened before the research starts.

   "The influence has the possibility of immense growth. It's a model of doing, not theory" (Expert 3).

   "Yes, this is universality – usefulness in different situations. This guideline if used over and over can ensure the same results every time. The analytical and application skills of teachers should be strengthened before the research starts" (Expert 2).

Expert 1 provided, in commenting on the strengths and weaknesses of each design principle, valuable additional information on how each design principle can help participants and what they, when using the design principle, need to be aware of. Because these comments, although they were not the main purpose of the formative evaluation of the expert appraisal, were considered also important to improve the expected practicality and effectiveness of workable paper-based support Prototype 2, it was decided to include these comments in the workable paper-based support prototype, support Prototype 3.

6.3.2 Discussion

The design and formative evaluation of paper-based support Prototype 2 led to insights into the expected practicality and expected effectiveness of support Prototype 3 in supporting and guiding multigrade teachers and principals.

Paper-based support Prototype 2 was designed to explain ways in which multigrade teachers and principals, when using support Prototype 2, are supported and guided to see what they had

to do to function as a PLC. The design principles of support Prototype 3 stayed the same as the design principles for paper-based support Prototype 2. Only minor changes were made to the procedures of the design principles of support Prototype 2 to ensure that:

- the shared mission, vision, values and goals include multigrade content in order to foster the existence of multigrade as a structure;
- a checklist, based on indicators, timelines and targets, is included and available to continually revise progress and to provide support and guidance where needed; and
- all members are trained before the research starts in order to strengthen their analytical and application skills.

In order to improve the workable paper-based support prototype format that is clear and easily understandable, changes were also made to the workable paper-based format of support Prototype 2 to ensure that:

- it is clear to the multigrade teachers and principals how each design principle can help, support and guide them and of what they need to be aware, when using the design principle (Figure 6.5);
- it is clear to the person taking the lead that he/she must know the stages very well in order to guide the group through the various steps;
- it is clear to the multigrade teachers and principals that loyalty and trust between members play an important role in order for supportive and shared leadership to work in the real user setting;
- it is clear, in order to avoid that the personality of an individual dominate the collaboration, that there should be a spirit of listening to one another in order to see how they can improve their current teaching in their classrooms; and
- a checklist (Figure 6.4) is available to continually revise progress and to provide support and guidance.

Steps to follow:
Step 1
Supportive and shared leadership
(Someone in the group must take the lead.**)**

How does this step help us?	**We need to be aware of:**	**What must we do?**
A PLC provides the opportunity for identifying and experimenting with new approaches, which should improve multigrade methodologies. A PLC provides the opportunity to share new practices and adapt them to teachers' own contexts and to take ownership of these new practices.	Teachers who are not positive with regard to their expectations of a PLC will have a negative effect on the functioning of a PLC. Teachers who do not have a focus on renewal will not participate full-heartedly. What weight does the decision carry among the participators? Who will do the quality assurance of the agreed-upon activities, resources and practices? Are the decisions made in line with the expectations of the National Curriculum?	***Guidelines*** One of us always takes the lead in the group. We support one another when someone experiences difficulties. We trust one another and we are loyal to one another. The leader should know the stages very well. The leader must guide the group through the various steps.

Support indicator
Enhances shared leadership capacity in order to empower all members in a group to share in the vision and mission and to make effective decisions that positively affect learning and achievement.

Figure 6.5: An understandable and workable format of a design principle and guidelines of support Prototype 3

These changes were essential to ensure that the design principles of support Prototype 3 practically support and guide multigrade teachers and principals.

The design principles and guidelines from Cycle 2 of the Prototyping Phase are summarised in Table 6.5, providing an overview of the design principles and guidelines of support Prototype 3.

6.4 Conclusion

In this chapter the first two cycles of the Prototyping Phase were documented with emphasis on establishing the conditions for the use of a support Prototype (PLC). This was achieved by examining and improving the different components of a support Prototype (PLC). The design guidelines from these cycles informed the development of a third support prototype

(PLC), support Prototype 3. The next chapter focuses on transforming conditions of actual support and guidance to multigrade teachers and principals, working together in their day-to-day user-setting as a network cluster for collective learning and its implementation.

Table 6.5: Overview of the design principles and guidelines of support Prototype 3

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
Provide ongoing relevant support and guidance to multigrade schools. *Support and guidance that focused on*: support to all multigrade teachers and principals working together as a network cluster for collective learning and its implementation in multigrade classrooms.	Multigrade teachers and principals plan and work together in a PLC.	Provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge. The PLC should be able to work and plan for a period of time without the help of an external source. The knowledge and skills received during the training should be sufficient to empower each member of a PLC in order for him/her to understand his/her specific role in a PLC and what is expected of each. The design principles and guidelines should already be adapted for actual use by the multigrade teachers and principals and should be available in a practical and workable format. The practical and working format of the design principles and guidelines should be sufficient for a PLC to function on its own for a period of time without the help of an external source.
	Supportive and shared leadership.	Building internal capacity for leadership is necessary among the team members. Share responsibility for leadership among the team members. Create a context supportive of change. Provide time for the team to collaborate. Identify critical questions that must guide the work of the collaborative team. Guide the team to create products as a result of their collaboration. Plan and provide resources for the team. Provide the team with relevant data and information. Check the team's progress. Provide continuous assistance to the team and the team members. All members must be trained as potential leaders.
	Shared mission, vision, values and goals.	Develop, articulate and communicate the intended change through a shared: mission – their purpose for working together as a PLC; vision – a clear direction that they want to go; values – commitments; and goals – indicators, timelines and targets. Indicators, timelines and targets must be visible and available on paper to all the members at any time. Include multigrade content to foster the existence of multigrade as a structure. A checklist, based on indicators, timelines and targets, should be available to continually revise progress and to provide support.
	Collaborative culture with the focus on learning.	The team members work together interdependently to analyse and to impact professional practice in order to improve results for their learners, their team and their school.
	Collective enquiry into best practice and current reality.	The team members enquire together into best practices about teaching for their context. The team members make a candid clarification of their current practices. The team members make an honest assessment of their current practices.

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
	Action orientation: learning by doing.	The team members turn their aspirations into action. The team members turn their vision into reality. The team members develop a deeper and more profound knowledge and greater commitment through learning by doing. The team members implement their goals. Demonstrate what must be done in order for the members to see what they must do and learn from this demonstration before they attempt it in the classrooms.
	Commitment to continuous improvement.	The team members gather evidence. The team members develop strategies and ideas. The team members implement the strategies and ideas. The team members analyse the impact of changes/results. The team members apply the new knowledge in the next cycle of continuous improvement. All members must be trained before the research starts to strengthen their analytical and application skills.

CHAPTER 7

PROTOTYPING PHASE: TRANSFORMING CONDITIONS FOR USE INTO USE (CYCLE 3)

7.1 Introduction

The design focus of the Prototyping Phase was to establish practical and effective conditions of support and guidance to multigrade teachers and principals, working together as a network cluster for collective learning and its implementation, and then to progress to facilitating the transformation of these practical and effective conditions to the day-to-day user setting of multigrade teachers and principals.

The first part (two cycles) of the Prototyping Phase focused on establishing the conditions for use of the support prototype (PLC) (Chapter 6) outside the day-to-day user setting of multigrade teachers and principals. In this chapter, the natural progression of the Prototyping Phase examines how to transform these conditions into use by multigrade schools, and whether the characteristics of a PLC are actually supporting and guiding multigrade teachers and principals to work together in their day-to-day user setting as a network cluster for collective learning and its implementation. The chapter takes a closer look at the research design and results for the third design cycle employed during the Prototyping Phase.

The complete research cycle discussed in this chapter consisted of the development of successive prototypes of the support prototype (PLC), which were formatively evaluated to inform the development of the final prototype for this research. The focus of this chapter is illustrated graphically in Figure 7.1. Every full design cycle consists of the prototype adaptation followed by implementation and corresponding formative evaluation of that prototype.

In subsequent sections the third cycle (Prototype 4) of the Prototyping Phase is discussed, beginning with a description of the prototype, followed by a discussion of the research design used to evaluate the prototype. The evaluation activities are guided by the research questions addressed and the evaluative focus for Cycle 3. The implementation of Prototype 3 by 60 multigrade teachers and principals in 24 schools is discussed in Section 7.2. The formative evaluation (Section 7.2.1) of Cycle 3 examines the selection of participants (Section 7.2.1.1), data collection (Section 7.2.1.2), data capturing and analysis (Section 7.2.1.3) and the results and design guidelines of the observation and interviews (Section 7.2.1.4).

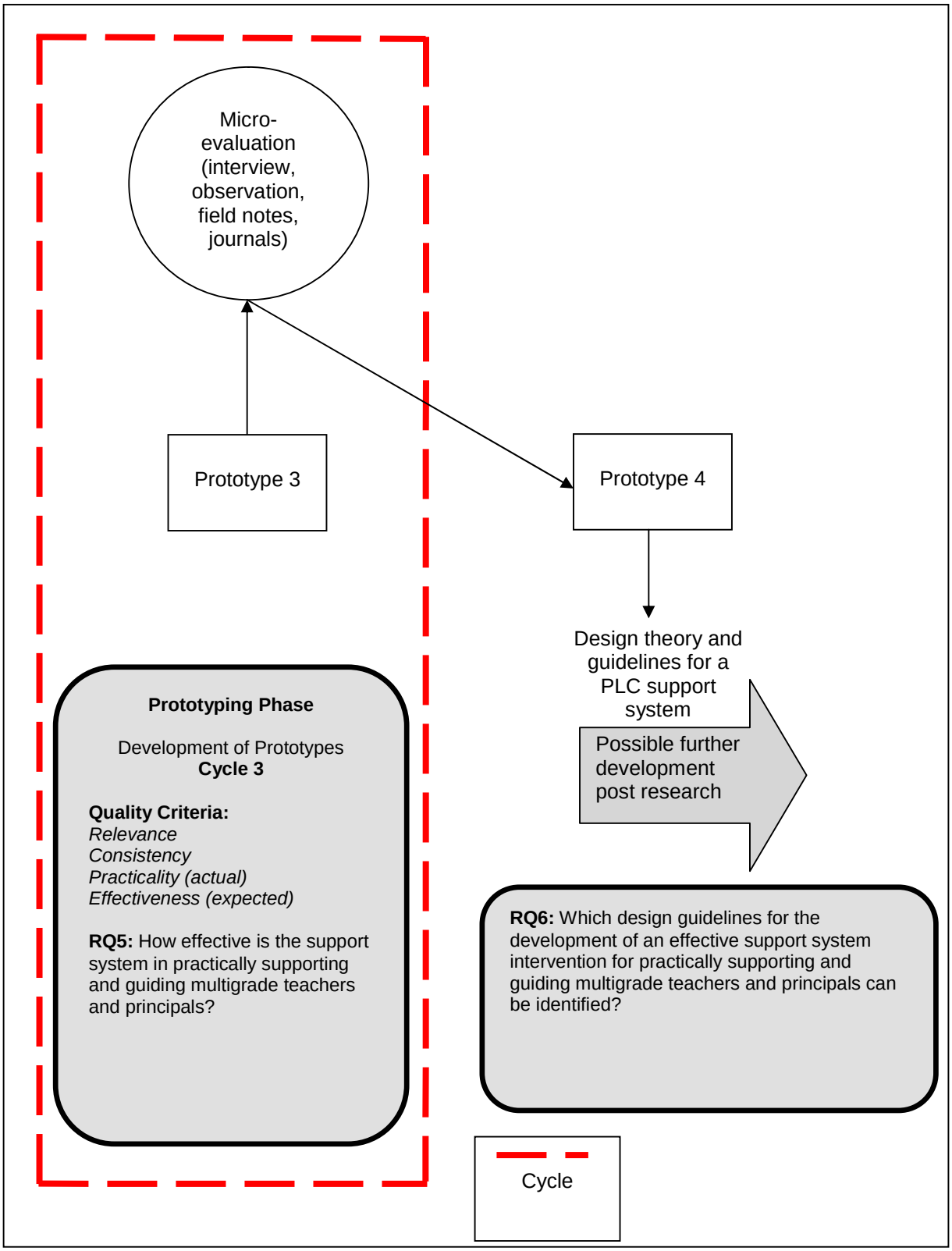


Figure 7.1: Prototyping Phase – Cycle 3

7.2 Cycle 3 (Prototype 4)

Support Prototype 4 incorporated the learning from Cycle 1 and 2 of the Prototyping Phase to establish the conditions to support and guide multigrade teachers and principals working

together as a network cluster for collective learning, and the implementation of these practices in multigrade classrooms. The design and evaluation of Cycle 3 focused on establishing the actual practicality and expected effectiveness of support Prototype 3 in supporting and guiding multigrade teachers and principals.

The formative evaluation for this cycle employed the judgements of multigrade teachers and principals of 24 multigrade schools (Table 4.11 in Chapter 4). Support Prototype 3 was used by the CMGE as a support system to support and guide multigrade teachers and principals, involved in a year-long project, in order to familiarise them with multigrade education methods and to empower them to apply those methods in their classrooms. The multigrade teachers and principals were asked, as representatives of multigrade education, to function as a PLC (Table 4.11 in Chapter 4) in their day-to-day user setting by using the design principles and guidelines of support Prototype 3 to support and guide them. The transformation of the conditions of support into action in a PLC, and whether the characteristics of a PLC were actually supporting and guiding multigrade teachers and principals to work together, was investigated through observations of the PLC meetings, the actual implementation of the multigrade education methods in each classroom, and focus group interviews with each PLC.

Open and general evaluation questions were employed during the focus group interviews with the four PLCs, allowing them, as PLCs, to make suggestions for improvements to the global design elements of support Prototype 3.

The focus was thus to determine how multigrade teachers and principals were interacting with the support prototype and the barriers or facilitating factors in respect of its employment in each PLC's specific context. The research question for Cycle 3 aimed to establish how these aspects were used in the context for which they were designed, and to inform further improvement of the intervention. While there is a specific focus for this cycle, there is always some deliberate overlap, and a cycle may address some aspects of other research questions or evaluative foci.

Cycle 3 therefore focused on the following research question (RQ 5):

How effective is the support system in practically supporting and guiding multigrade teachers and principals?

The design principles and guidelines generated related specifications to establish the actual practicality and expected effectiveness of the characteristics of a PLC, when transformed for use into action in multigrade schools in order to support and guide multigrade teachers and principals working together.

Establishing conditions for use: This development stage aimed at improving the actual practicality and expected effectiveness of the characteristics of a PLC in supporting and guiding multigrade teachers and principals. The evaluation in this cycle focused specifically on the generic criteria (Table 4.3 in Chapter 4) of practicality and effectiveness:

- Practicality (actual): The characteristics of the support system are actually usable in the settings for which the system has been designed and developed. Here in particular the focus is on whether the characteristics of a PLC are actually supporting and guiding multigrade teachers and principals; and
- Effectiveness (expected): Refers to the concept that it should be possible to realise developers' intentions for the multigrade teachers and principals under normal conditions.

7.2.1 Formative evaluation of support Prototype 4

The formative evaluation of Prototype 4 took place through two processes. Firstly, the multigrade teachers and principals were invited to function as a PLC, to support and guide multigrade teachers and principals, involved in a year-long project (Project 8) of the CMGE, in order to familiarise them with multigrade education methods and to empower them to apply those methods in their classrooms. They were asked to implement, after training, the design principles and guidelines of support Prototype 3 to support and guide them in functioning as a PLC, to evaluate the design principles and guidelines of the support Prototype 3 in a micro-evaluation, and to provide verbal feedback during focus group interviews.

The CMGE introduced a framework (Table 7.1), consisting of four phases, to operationalise the multigrade education methods and to empower multigrade teachers and principals to apply those methods in their multigrade classrooms. During the first phase the design principles and guidelines of support Prototype 3 were introduced to the multigrade teachers and principals in the form of a guide. The paper-based prototype made it clear and comprehensive to the multigrade teachers and principals how the design principles and guidelines, presented separately on paper, and explaining the support indicator and guidelines of each design principle, could support and guide them, and of what they needed to be aware when using the design principles (Figure 6.5 in Chapter 6). The paper-based prototype also included a graphic illustration (Figure 6.2 in Chapter 6) of the design principles in order to make it clear and to guide the multigrade teachers and principals in what they had to do to function as a PLC in order to move from point A (multigrade teachers and principals as active participants involved in their own learning) to point B (collective learning and its implementation in a classroom).

During the first phase the multigrade teachers and principals received training on how to use the guide to function as a PLC and to understand the whole process. In the second phase the multigrade teachers and principals used the design principles and guidelines of support Prototype 3 to structure and to guide their functioning as a PLC. They also transformed support Prototype 3 (Table 7.2) to address their unique needs and situations. All four PLCs received the same training simultaneously and the same transformed design principles and guidelines of support Prototype 3 (Table 7.2), to address their unique needs and situations.

Table 7.1: Framework of CMGE to operationalise the multigrade education methods and to empower the multigrade teachers and principals to apply those methods in their multigrade classrooms

Phase	Activities	Timeline
Phase 1 Professional development	**Training** (CMGE short course content, developed to train 700 multigrade teachers in 9 provinces for the DBE) Pedagogy - Learner Governing Body and Community Map in a multigrade school - Mental Math in a multigrade classroom - Lay-out of a multigrade classroom - Peer Tutoring in a multigrade classroom - Reading (Do-and-Learn) support Design principles and guidelines of a PLC IT in a multigrade classroom Using the multigrade learning guide in a multigrade classroom	January 2012 – February 2012
Phase 2 Creating a support system	Functioning as a PLC	March 2012 – December 2013
	Observation To determine to what extent the multigrade teachers and principals are applying (visible and observable) the design principles and guidelines of support Prototype 3 and whether the characteristics of a PLC are actually supporting and guiding multigrade teachers and principals to work together in their day-to-day user setting as a network cluster for collective learning and its implementation.	April 2012 – October 2012
Phase 3 Implementation	**Implementation** Multigrade pedagogy in schools Technology in multigrade schools Learning materials in multigrade classrooms	March 2012 – October 2012

Phase	Activities	Timeline
	Observation To determine to what extent the training is visible or observable in each multigrade classroom in the school	5 – 22 August 2012
Phase 4 Institutionalisation	Full implementation of all aspects in a multigrade school	November 2012 – December 2013

Table 7.2: Transformed design principles and guidelines of support Prototype 3 to address the unique needs and situation of the multigrade teachers and principals of Project 8.

Professional Learning Community Intervention (PLCI) for the seven multigrade teachers and principals			
Purpose/Function	**Context**	**Substantive emphasis**	**Procedural emphasis**
Provide ongoing relevant support and guidance to multigrade teachers and principals, working together as a PLC. *Support and guidance that focused on ...* Creating a context supportive of change. Providing time for collaboration. Identifying critical questions that must guide the work of the collaborative teams. Developing, articulating and communicating a shared vision of the intended change. Planning and providing resources. Investing in professional learning. Guiding the teams to create products as a result of their collaboration. Checking the progress. Providing teams with relevant data and information. Providing continuous assistance. *... in implementing* Learner Governing Body and Community Map; Mental Math; Lay-out of a classroom; Peer Tutoring; Reading (Do-and-Learn) support: *... in multigrade schools in Montagu, Ashton and Bonnievale.*	Establish the use of a support system (PLC) for multigrade teachers and principals to use in their day-to-day user setting in multigrade schools in Montagu, Ashton and Bonnievale.	Multigrade role-players plan and work together in a PLC.	Provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge.
		Supportive and shared leadership.	Building internal capacity for leadership is necessary among the team members. Share responsibility for leadership among the team members. Create a context supportive of change. Provide time for the team to collaborate. Identify critical questions that must guide the work of the collaborative team. Guide the team to create products as a result of their collaboration. Plan and provide resources for the team. Provide the team with relevant data and information. Check the team's progress. Provide continuous assistance to the team and the team members.
		Shared mission, vision, values and goals.	Develop, articulate and communicate the intended change through a shared: mission – their purpose for working together as a PLC; vision – a clear direction that they want to go; values – collective commitments; and goals – indicators, timelines and targets.
		Collaborative culture with the focus on learning	The team members work together interdependently to analyse and to impact professional practice in order to improve results for their learners, their team and their school.
		Collective enquiry into best practice and current reality.	The team members enquire together into best practice for their context. The team members make a candid clarification of their current practices. The team members make an honest assessment of their current practices.
		Action orientation: learning by doing.	The team members turn their aspirations into action. The team members turn their vision into reality. The team members develop a deeper and more profound knowledge and greater commitment by learning by doing it. The team members implement their goals.

Professional Learning Community Intervention (PLCI) for the seven multigrade teachers and principals			
Purpose/Function	**Context**	**Substantive emphasis**	**Procedural emphasis**
		Commitment to continuous improvement.	The team members gather evidence. The team members develop strategies and ideas. The team members implement the strategies and ideas. The team members analyse the impact of changes/results. The team members apply the new knowledge in the next cycle of continuous improvement.

The design principles and guidelines for the Project 8 intervention remained the same as the design principles (substantive emphasis) and guidelines (procedural emphasis) of support Prototype 3. Minor changes were made to support Prototype 3, developed during Cycle 2:

- The purpose of support Prototype 3 was adapted to support and guide the multigrade teachers and principals, in their day-to-day user setting in multigrade schools in Montagu, Ashton and Bonnievale (context), to implement a Learner Governing Body; a Community Map; Mental Math; Lay-out of a classroom; Peer Tutoring and Reading (Do-and-Learn) support in a multigrade school.
- During the second phase PLCs also transferred their unique shared mission, vision, values and goals to ensure that the indicators, timelines and targets were visible and available to all the members of their PLCs at any time in order for them to know:
    - what they had to do;
    - when they had to do it;
    - who had to do it;
    - how they had to do it; and
    - what proof they had to present to show that they had used or implemented it in the classroom.
- Although the five pedagogic activities and the design principles and guidelines formed the same basis for all four of the PLCs, PLCs added and determined their PLCs' own unique indicators, timelines and targets.

In the first phase, meeting and training dates were determined by the CMGE and the officials of the Cape Winelands Education District. The dates of the observation of the actual implementation of the five pedagogic activities in classrooms were also determined by the CMGE and the officials of the Cape Winelands Education District. The PLCs had to work out their own timelines of functioning as PLCs and implementation of the five pedagogic activities in Phases 2 and 3. In order for the researcher to observe the functioning of the PLCs,

according to the design principles and guidelines of support Prototype 3, they had to inform him of the dates of their meetings as PLCs.

Secondly, each multigrade teacher and principal involved in this cycle received a visit from a multigrade consultant and adviser (he was also the project manager of the MGRSI of the WCED in 2002) of the CMGE, in his/her classroom to determine to what extent the five pedagogic activities (Table 7.3), done on the basis of checklists (Appendix E) handed out and discussed in advance, were visible or observable in each classroom or in the school.

Table 7.3: Multigrade education methods - pedagogic activities (Jordaan & Joubert, 2011a)

Pedagogic activities
• Learner Governing Body and Community Map in a multigrade school • Mental Math in a multigrade classroom • Lay-out of a multigrade classroom • Peer Tutoring in a multigrade classroom • Reading (Do-and-Learn) support

The research procedures for the formative evaluation of support Prototype 4 are discussed below.

7.2.1.1 Selection of participants

The multigrade teachers and principals came from multigrade schools in the Cape Winelands Education District with the nearest towns (Table 4.11 in Chapter 4) to the respective schools being Montagu, Ashton and Bonnievale. The district officers in the Cape Winelands Education District in the Western Cape divided the 24 schools into the four PLCs, based on their geographical position.

Participation in Project 8 was voluntary for the multigrade teachers and principals of the 24 schools. Sixty multigrade teachers (Appendix F) took part in the Project 8 intervention with 24 of the 60 multigrade teachers also filling the position of principal at their school:

- PLC A – 12 multigrade teachers (6 filling the position of principal);
- PLC B – 13 multigrade teachers (6 filling the position of principal);
- PLC C – 21 multigrade teachers (7 filling the position of principal); and
- PLC D – 14 multigrade teachers (5 filling the position of principal).

The 24 multigrade schools represented a two-man staffed multigrade school up to an eight-man staffed multigrade school (Table 4.11 in Chapter 4).

7.2.1.2 Data collection

The data collection for the micro-evaluation took place through three processes to ensure the validity of the data collected (Cohen *et al.*, 2000:121). The three processes were:

1. Observer-as-participant observation (n = 2): the PLCs were observed by the researcher during their usual meetings, while functioning as PLCs. The participant observation served to enable the researcher to determine to what extent the multigrade teachers and principals were applying (visible and observable) the design principles and guidelines of support Prototype 3 and whether the characteristics of a PLC were actually supporting and guiding multigrade teachers and principals.

2. Structured observation (n = 58): each multigrade teacher and principal involved in the Project 8 intervention was observed in his/her school or classroom by a field worker (a researcher of the CMGE) during predetermined dates in Phase 3 (Table 7.1). Two of the teachers were not observed in their classrooms because of floods in their area during the time of observation (Appendix F). The structured observation served to enable the researcher to generate numerical data from the observation in order to make comparisons between settings, situations, patterns and trends to be noted or calculated (Cohen *et al.*, 2000:306). The observational schedule focused on the visibility of the implementation of the five pedagogic activities in the classrooms of the schools, based on a predetermined checklist (Appendix E) with a criterion for each of the five activities.

3. Standardised open-ended focus group interviews (n = 4): these were conducted with each PLC. The interviews served to follow up the participant-as-observer observations, the journals and the structured observations to gain further clarification. The open-ended questions focused on:

    - the influence of the design principles and guidelines of support Prototype 3 in supporting and guiding multigrade teachers and principals;
    - the practicality and effectiveness of the design principles and guidelines of support Prototype 3 for use;
    - the barriers to use of the design principles and guidelines of support Prototype 3; and
    - the possible improvements in supporting and guiding multigrade teachers and principals.

The data collected through these processes were thematically analysed, according to the design principles (substantive emphasis in Table 6.5, Chapter 6).

7.2.1.3 Data capturing and analysis

Data from the structured observation was captured in textual form for qualitative analysis and in *Excel* and *SPSS* for descriptive analysis of frequencies. The qualitative data from the observer-as-participant observations and interviews was captured through field notes, observation and transcription (digital voice recorder) of interview data and the analysis process was facilitated by the computer-aided qualitative data analysis programme, *Atlas.ti*.

Data from the four PLCs was analysed throughout the data collection process. Codes were generated through an inductive process and allocated to each unit of text. Once coding was completed, codes were clustered in meaningful groups to generate themes. The analysis informed the development of earlier support prototypes and helped to clarify information received from earlier data processes. This iterative data collection and analysis process resulted in a rich picture of functioning as a PLC in supporting and guiding multigrade teachers and principals.

7.2.1.4 Results and design guidelines

For a period of five months (according to the framework of the CMGE, Table 7.1), the four PLCs were left to function on their own as PLCs, without the help of an external source. They also did not receive any prescribed dates when they had to meet or a reason why they had to meet. They had to use the design principles and guidelines of support Prototype 3 and the training that they had received at the workshop to function as PLCs. The design principles and guidelines of support Prototype 3 practically supported and guided the multigrade teachers and principals, involved in Project 8, over a five-month period through a process of functioning, planning and working in their unique context and according to the needs they wanted to address.

"It supported and guided us through a process that we could understand and know what was expected of us" (data from standardised open-ended focus group interview - PLC A).

During the observations it became clear that the design principles and guidelines of support Prototype 3 were very informative and practical in supporting and guiding multigrade teachers and principals. During the interviews the multigrade teachers and principals generally expressed the same view. The design principles and guidelines created a platform for them to talk to one another about the issues, to clarify what the expectations were and to

see things in perspective. It also served as a bridge between external actors (training and officials of the District Office) and reality, and helped to reconcile expectations with reality.

"There were not really people that could help us. The PLC has helped us to see things in perspective. The PLC supports me with the knowledge that I realise the other members suffer the same hardship that I do. Then it makes the burden not so heavy for me anymore [*sic*]. They are in the same boat as I am. It helps me to understand the problem better" (data from standardised open-ended focus group interview – PLC A).

"If it was not for the PLC, every person would have done his own thing. The PLC has created the platform where we can talk to each other about the issues and what the expectations was [*sic*]. It also serves as a bridge between the external actors (external assessor and officials of the District Office) and the reality in which we stand and the problems we face every day in the classrooms. The PLC has helped to reconcile expectations with reality. We can learn from teachers (with experience) what works in the classrooms and what does not work and hear what's going on at their schools. There are things that just do not work and there are things that work great" (data from standardised open-ended focus group interview – PLC B).

The observations and interviews also made it clear that design principles and guidelines of support Prototype 3 did not just support and guide the multigrade teachers and principals to function as PLCs, but also supported and guided the multigrade teachers and principals to practically implement the criteria (Table 7.3) in their multigrade classrooms.

"After we discussed it there and saw a demonstration, we could go back to our classrooms and implement it. We were shown in a multigrade class context exactly what we should do if we have three grades in one classroom. We can now talk to someone – in the past we did not know with whom to talk and we did not ask questions of someone we did not know. Now we know each other and it makes it easier for us to share problems with each other. It allows us to contact people and ask how they are doing it in their schools. In the past we saw each other at general meetings during the year. Planning and working together as a PLC opened a channel for us to talk with each other. The PLC helps us to obtain knowledge and now that everyone is aware of a subject it gives one more confidence to ask and to help" (data from standardised open-ended focus group interview – PLC B).

"We want it to work and want to go out and do it. Now I can go back and know the learners in our multigrade classrooms are in safe hands" (data from standardised open-ended focus group interview – PLC B).

Two of the PLCs (A & B) met four times, one PLC (C) met three times and one PLC (D) met twice to plan and work together (Table 7.4) in order to determine and to transfer their PLCs' own unique indicators, timelines and targets for Project 8 in order for them to know:

- what they must do;
- when they must do it;
- who must do it;
- how they must do it; and
- what proof they must present to show that they have used or implemented the five pedagogic activities in the classrooms.

Table 7.4: Planning and working together as a PLC

Professional Learning Community	Frequency of planning and working together as a PLC	Barriers to planning and working together as a PLC
A	4	Travelling cost to meet as a PLC.
B	4	Travelling cost to meet as a PLC. Schools that did not attend the meetings without a reason. Teachers that took turns to represent their school at a cluster meeting.
C	3	Travelling cost to meet as a PLC. Members wanted to work according to the Phase they teach in and not as a PLC serving all Phases.
D	2	Travelling cost to meet as a PLC. Schools that did not attend the meetings owing to conflict working together as a team.

The means plot for the PLC's implementation of criteria (Figure 7.2) provides a picture of each PLC's actual implementation of the criteria of the five pedagogic activities in a classroom (Appendices G & H):

- PLC A

  PLC A succeeded in implementing 50% and more of the criteria (Figure 7.2) in each of the five pedagogic activities. In PLC A 83% of the teacher's total ratio of implementation (Figure 7.3) of the criteria for all five of the pedagogic activities were 50% or higher.

- PLC B

  PLC B succeeded in implementing 50% and more of the criteria (Figure 7.2) in four of the five pedagogic activities. In PLC B 64% of the teacher's total ratio of

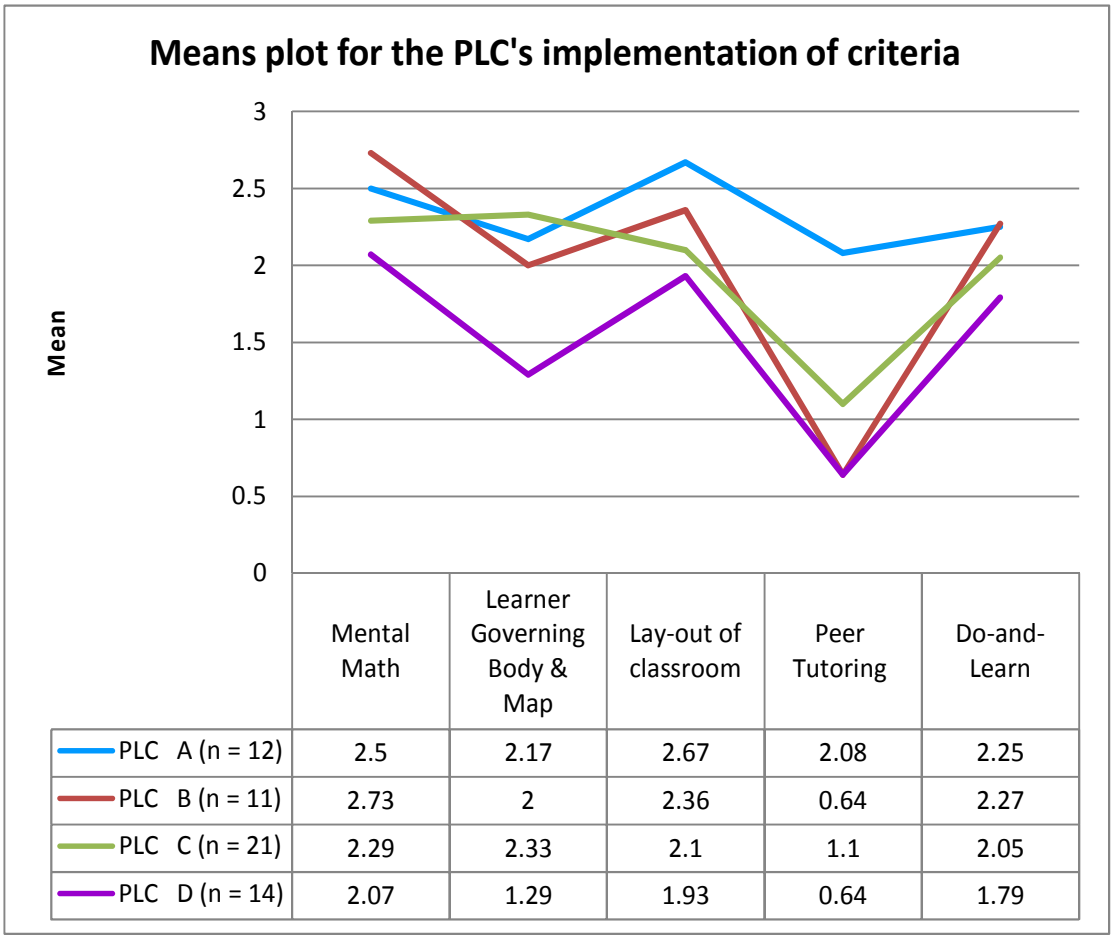
implementation (Figure 7.4) of the criteria for all five of the pedagogic activities were 50% or higher.

- PLC C

  PLC C succeeded in implementing 50% and more of the criteria (Figure 7.2) in four of the five pedagogic activities. In PLC C 62% of the teacher's total ratio of implementation (Figure 7.5) of the criteria for all five of the pedagogic activities were 50% or higher.

- PLC D

  PLC D succeeded in implementing 50% and more of the criteria (Figure 7.2) in only one of the five pedagogic activities. In PLC D 21% of the teacher's total ratio of implementation (Figure 7.6) of the criteria for all five of the pedagogic activities were 50% or higher.



	Mental Math	Learner Governing Body & Map	Lay-out of classroom	Peer Tutoring	Do-and-Learn
PLC A (n = 12)	2.5	2.17	2.67	2.08	2.25
PLC B (n = 11)	2.73	2	2.36	0.64	2.27
PLC C (n = 21)	2.29	2.33	2.1	1.1	2.05
PLC D (n = 14)	2.07	1.29	1.93	0.64	1.79

Figure 7.2: **PLC's implementation of criteria of the five pedagogic activities in a multigrade classroom (Appendix H)**

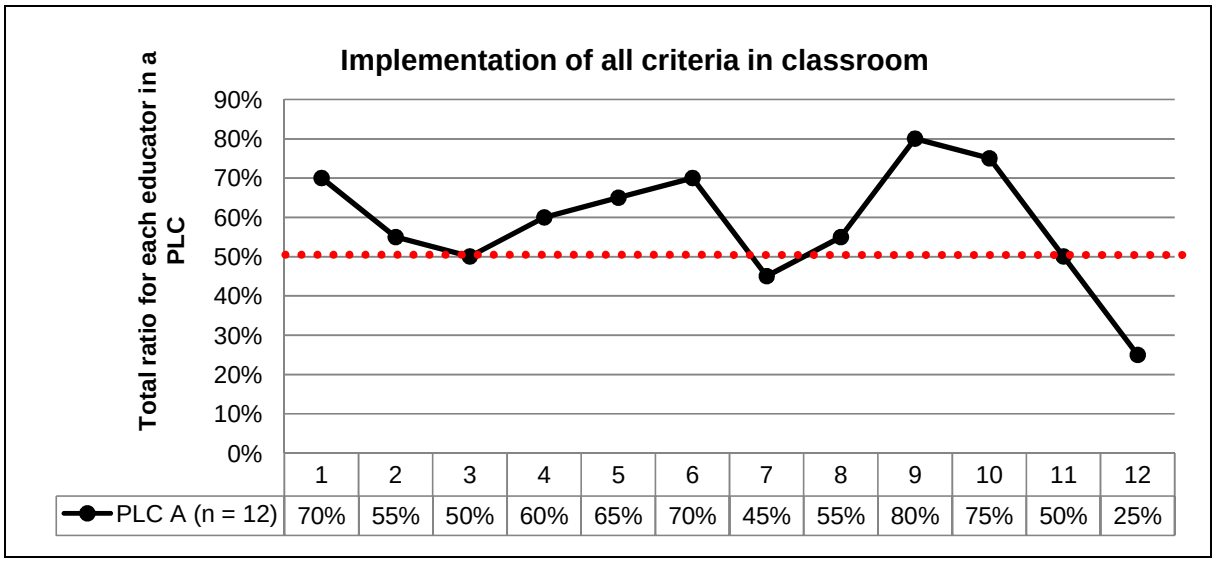


Figure 7.3: Teacher's total ratio of implementation in PLC A (Appendix G)

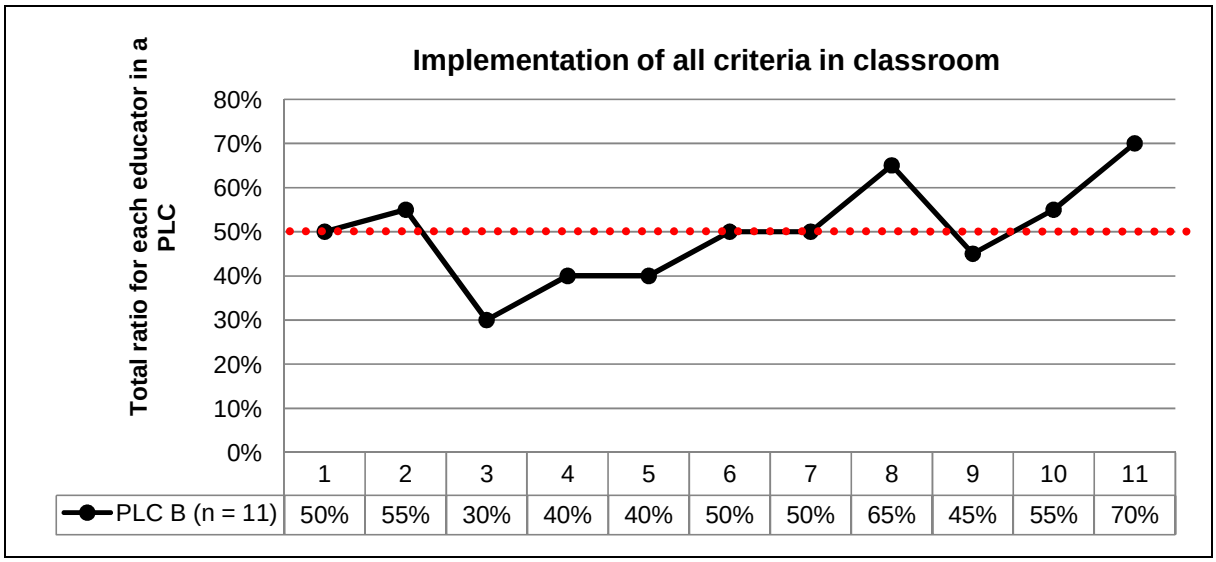


Figure 7.4: Teacher's total ratio of implementation in PLC B (Appendix G)

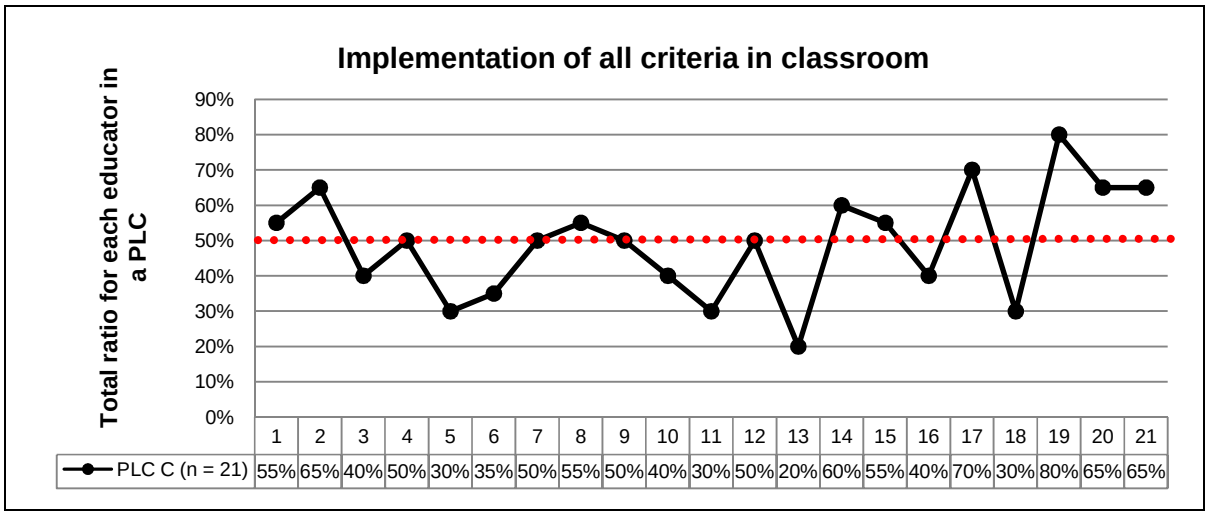


Figure 7.5: Teacher's total ratio of implementation in PLC C (Appendix G)

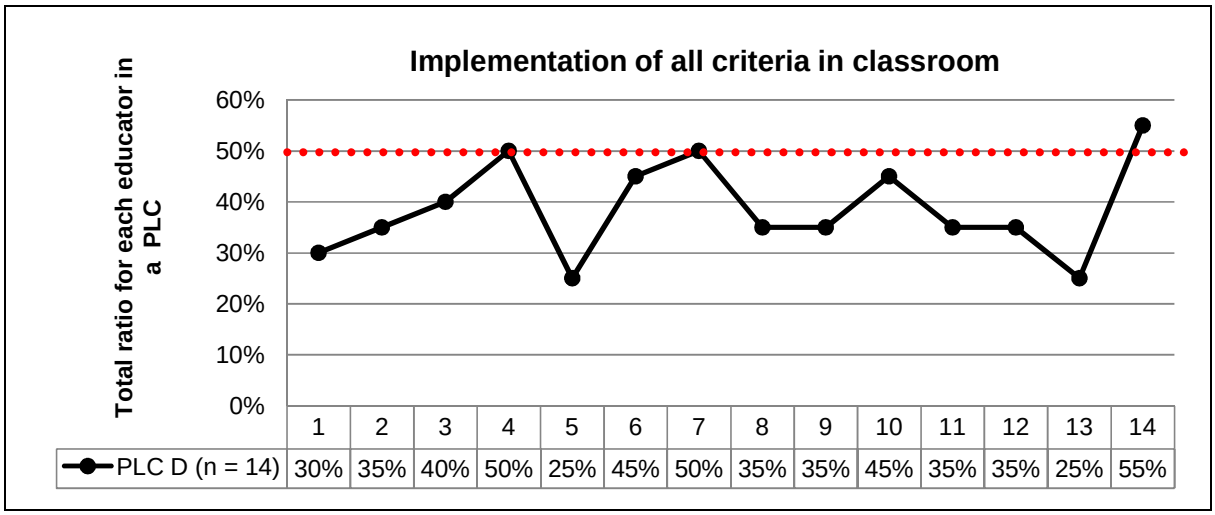


Figure 7.6: Teacher's total ratio of implementation in PLC D (Appendix G)

Although it was not the main purpose of the formative evaluation of this cycle, the means plot of all the PLCs shows that PLC A differs from PLC D (Figure 7.7) with regard to the implementation of the criteria in a multigrade classroom. Both PLCs used the same design principles and guidelines of support Prototype 3 to practically support and guide the multigrade teachers and principals in the PLCs to plan and work practically together in order to determine and to transfer their PLCs' own unique indicators, timelines and targets to the classroom. The significant differences between PLC A and B, based on observations (observer-as-participant) and interviews, were that some of the schools in PLC D refused to attend the PLC meetings or did not give their co-operation to the PLC leader; also PLC D could only meet twice, as a PLC, during the five months (Table 7.4).

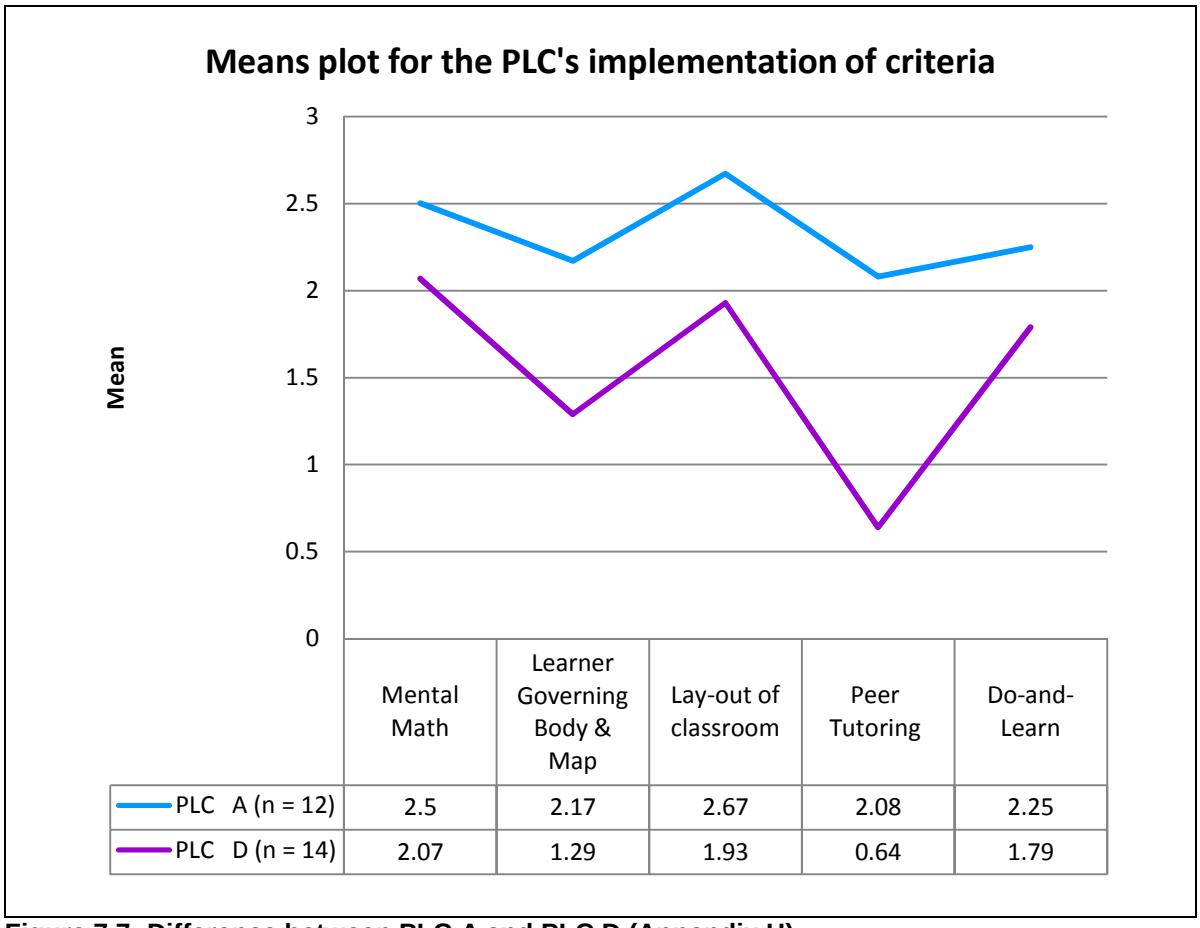


Figure 7.7: Difference between PLC A and PLC D (Appendix H)

I. Multigrade role-players plan and work together in a PLC

The following design guidelines were generated from the data to improve the actual practicality and effectiveness when multigrade teachers and principals plan and work together in a PLC:

1. Communication plays a vital role in the success of functioning as a PLC. "The entire functioning of a PLC could crash if communication is not well with and between members of a PLC" (data from standardised open-ended focus group interview – PLC A).
   - As multigrade schools are far apart from one another and from the District Office, it is important that all multigrade teachers and principals of a PLC communicate with one another at all times (data from standardised open-ended focus group interview – PLCs A, B & C).
   - Determine beforehand which methods of communication are going to be the best method to ensure communication with all members of a PLC (data from standardised open-ended focus group interview – PLCs A, B & C).
   - To avoid that one person breaks the link of communication, by not sending the information to the next person in the information chain at a school, every message

should be sent to all the multigrade teachers and principals in a PLC, including to the officials at the District Office, so they can be aware of what happens, what the problems are, how members communicate with one another, who is participating in the project and who stays away (data from standardised open-ended focus group interview – PLCs A & B).

- Every multigrade teacher and principal, including district officials, must report back to the PLC leader that they have received the message (data from observer-as-participant observation).
- Every multigrade teacher and principal must report back on their progress in following the instructions (data from standardised open-ended focus group interview – PLCs A & B and observer-as-participant observation).
- Keep minutes of every meeting, indicators, timelines and targets to ensure that all evidence and communication are on paper. Send it within two days via the communication channels to every multigrade teacher and principal. This will help them to look at the records of what has been done, what still needs to be done and to see what was discussed (data from standardised open-ended focus group interview – PLCs A & B.)
- The communication channel of a PLC should not be used to reprimand members that are not attending the meetings or that are not delivering according to the indicators, timelines and targets. This creates unnecessary conflict among the multigrade teachers and principals in a PLC and could undermine the effectiveness and functioning of a PLC (data from standardised open-ended focus group interview – PLC B and observer-as-participant observation).
- Communication and feedback between the person taking the lead in a PLC and the officials at the District Office should take place at fixed times and dates (data from standardised open-ended focus group interview – PLC B and observer-as-participant observation).

2. Distinguish between two processes when multigrade teachers and principals plan and work together in a PLC. The first process comprises the steps that need to be followed to function as a PLC. The second process encompasses the steps according to the indicators, timelines and targets identified by a PLC for their specific needs within their unique context. Both processes must be monitored on a regular basis to ensure that the processes are proceeding according to steps or to rectify dysfunctional PLCs (data from observer-as-participant observation).
3. There must be a 100% buy-in to a PLC and everyone must always give his/her best with assignments and tasks that are appropriate for use in a multigrade classroom (data from standardised open-ended focus group interview – PLCs C & D).

4. More emphasis should be placed on loyalty to one another and loyalty to the project. Address personal issues outside the functioning of the PLC to ensure that the focus of the PLC stays pure (data from standardised open-ended focus group interview – PLCs C & D).
5. Determine beforehand to whom the leaders of PLCs should go or whom they should contact when they need support or want to ask advice (data from observer-as-participant observation).

II. Supportive and shared leadership

The following design guidelines were generated from the data to improve the actual practicality and effectiveness of supportive and shared leadership when multigrade role-players plan and work together in a PLC:

1. Elect the leader of the PLC democratically based on his/her passion for multigrade education and his/her knowledge and experience of multigrade education or the problem in context. A leader does not convince people when they realise he/she does not have knowledge and experience of what he/she is talking about (data from standardised open-ended focus group interview – PLCs C & D and from observer-as-participant observation).
2. Contact the members of a PLC between steps to monitor individuals' progress and to encourage them (data from observer-as-participant observation).
3. The leader must ensure that the administration (minutes of every meeting, indicators, timelines and targets) is on paper and available to every multigrade teacher and principal in a PLC (data from standardised open-ended focus group interview – PLCs A, B & C and from observer-as-participant observation).

III. Shared mission, vision, values and goals

The following design guidelines were generated from the data to improve the actual practicality and effectiveness of shared mission, vision, values and goals when multigrade role-players plan and work together in a PLC:

1. Adjust the last column (Figure 7.8) of the template (Figure 6.4 in Chapter 6) from:
   - "We know what proof we will present to show that we have used or implemented it in the classroom." to "We know what proof we will present to show that we have used or implemented it effectively in the classroom." (Data from observer-as-participant observation.)

2. Adjust the last column (Figure 7.8) of the template (Figure 6.4 in Chapter 6) by adding to "Was it effective?":
   - "What measurement tool are we going to use to determine if the implementation was effective?"
   - "Who is going to assess us with above-mentioned assessment tool?" (Data from observer-as-participant observation.)

We know *what* we must do. Write it down!	**We know *how* we must do it.** Write it down!	**We know *who* must do it.** Write it down!	**We know *when* to do it.** Write it down!	We know *what proof* we will present to show that we have used or implemented it *effectively* in the classroom. Write it down!
				Was it effective? *What measurement tool are we going to use to determine if the implementation was effective?* *Who is going to assess us with the above-mentioned assessment tool?* *Does it work?* *What did we learn?* *Is there something that we are struggling with?* *How can we solve this?* Write it down!

Figure 7.8: Adjustment to the last column of the shared mission, vision, values and goals template

IV. Collaborative culture with the focus on learning

No additional design guidelines were generated to improve the actual practicality and effectiveness of a collaborative culture with the focus on learning.

V. Collective enquiry into best practice and current reality

The following design guidelines were generated from the data to improve the actual practicality and effectiveness of a collective enquiry into best practice and current reality:

1. The collective enquiry into current reality should allow that the actual classroom situation of members of a PLC be visited to see their current reality and how they do things in their classrooms. Because of barriers unique to multigrade schools (far distance to travel between schools and expenses; learners that travel by bus and who are not available after school hours for demonstration lessons; teachers can't leave

their classrooms with learners unattended to visit other schools during school hours; insufficient staff at a school to have a substitute teacher, allowing the class teacher to visit another school), the actual classroom situation of each teacher must be visually recorded and shown to the other teachers at a meeting (data from observer-as-participant observation).

VI. Action orientation: learning by doing

The following design guidelines were generated from the data to improve the actual practicality and effectiveness of action orientation: learning by doing when multigrade role-players plan and work together in a PLC:

1. An expert outside a PLC, since each PLC only has up to a certain level of expertise, can also be invited to demonstrate the lesson (data from standardised open-ended focus group interview – PLCs A & B).
2. The demonstration must include and explain the measurement tool that is going to be used to determine if the implementation is effective (data from observer-as-participant observation).
3. The 'learning by doing' in the classroom should include the application of the assessment tool during the implementation in order to support and guide the multigrade teacher and principal to be effective (data from observer-as-participant observation).
4. Record (visually), owing to the unique barriers, also the learning by first doing it in the classroom and then show this to the other members at a meeting (data from observer-as-participant observation).

VII. Commitment to continuous improvement

The following design guidelines were generated from the data to improve the actual practicality and effectiveness of a commitment to continuous improvement when multigrade role-players plan and work together in a PLC:

1. The assessment of the first cycle of implementation must guide and support the indicators, timelines and targets for the next cycle of implementation (data from standardised open-ended focus group interview – PLCs A, B, C & D; structured observation and from observer-as-participant observation).
2. The sooner the assessment is available to every multigrade teacher and principal in a PLC, the sooner they can move to the next cycle (data from standardised open-

ended focus group interview PLCs A, B, C & D; structured observation and from observer-as-participant observation).

3. Ensure that the assessment report explains to each multigrade teacher and principal in a PLC:
   - What they have achieved.
   - What they still need to do.
   - What the best way is to do what still needs to be done (data from observer-as-participant observation).
4. Determine beforehand if an expert, that is, not a member of the PLC, is going to be used to assess and give feedback to the PLC (data from observer-as-participant observation).

These changes were essential to ensure that the design principles of the support Prototype 3 practically supported and guided multigrade teachers and principals, working together in their day-to-day user setting as a network cluster for collective learning and its implementation. The design principles and guidelines from Cycle 3 of the Prototyping Phase are summarised in Table 7.5, providing an overview of the design principles and guidelines of support Prototype 4.

7.3 Conclusion

In this chapter the last cycle of the Prototyping Phase of the design research process was documented. The emphasis of the cycle was on transforming the conditions of use into action in multigrade schools. This was achieved by examining the actual practicality and expected effectiveness of the characteristics of a PLC in supporting and guiding multigrade teachers and principals. The design guidelines from this cycle informed the development of a fourth support prototype (PLC), support Prototype 4. In the next chapter the data from the design research process will be discussed along with the main design guidelines and recommendations for further research and design.

Table 7.5: Overview of the design principles and guidelines of support Prototype 4

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
Provide ongoing relevant support and guidance to multigrade schools. *Support and*	Multigrade teachers and principals plan and work together in a PLC.	Provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together. Share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge. The PLC must be able to work and plan for a period of time without the help of an external source. The knowledge and skills received during the training must be sufficient to empower each member of a PLC in order for him/her to understand his/her specific role in a PLC and what is expected of each.

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
guidance that focused on: support to all multigrade teachers and principals working together as a network cluster for collective learning and its implementation in multigrade classrooms.		The design principles and guidelines must already be adapted for actual use by the multigrade teachers and principals and must be available in a practical format. The practical format of the design principles and guidelines must be sufficient for a PLC to function on its own for a period of time without the help of an external source. Communication plays a vital role in the success of functioning as a PLC. - Communicate with one another at all times. - Determine beforehand which methods of communication are going to be the best method to ensure communication with all members of a PLC. - Every message must be sent to all the multigrade teachers and principals in a PLC, including to the officials at the District Office. - Every multigrade teacher and principal, including district officials, must report back to the PLC leader that they have received the message. - Every multigrade teacher and principal must report back on their progress in following the instructions. - Keep minutes of every meeting, indicators, timelines and targets to ensure that all evidence and communication are on paper. Send it within two days via the communication channels to every multigrade teacher and principal. - The communication channel of a PLC must not be used to reprimand members that do not attend the meetings or that are not delivering according to the indicators, timelines and targets. - Communication and feedback between the person taking the lead in a PLC, and the officials at the District Office, should take place at fixed times and dates. Distinguish between two processes when multigrade teachers and principals plan and work together in a PLC. The first process comprises the steps that need to be followed to function as a PLC. The second process comprises the steps according to the indicators, timelines and targets identified by a PLC, their specific needs in their unique context. Both processes must be monitored on a regular basis to ensure that the processes are proceeding according to steps or to rectify dysfunctional PLCs. There must be a 100% buy-in to a PLC and everyone must always give their best with assignments and tasks that are appropriate for use in a multigrade classroom. More emphasis must be placed on loyalty to one another and loyalty to the project. Address personal issues outside the functioning of the PLC. Determine beforehand where the leaders of PLCs should go or whom they should contact when they need support or want to ask for advice.
	Supportive and shared leadership.	Building internal capacity for leadership is necessary amongst the team members. Share responsibility for leadership amongst the team members. Create a context supportive of change. Provide time for the team to collaborate. Identify critical questions that must guide the work of the collaborative team. Guide the team to create products as a result of their collaboration. Plan and provide resources for the team. Provide the team with relevant data and information. Check the team's progress. Provide continuous assistance to the team and the team members. All members must be trained as potential leaders. Elect the leader of the PLC democratically based on his/her passion for multigrade education and his/her knowledge and experience of multigrade education or the problem in context. Contact the members of a PLC between steps to monitor individuals' progress and to encourage them. The leader must ensure that the administration (minutes of every meeting and indicators, timelines and targets) is on paper and available to every multigrade teacher and principal in a PLC.

Professional Learning Community Intervention (PLCI)		
Purpose/ Function	**Substantive emphasis**	**Procedural emphasis**
	Shared mission, vision, values and goals.	Develop, articulate and communicate the intended change through a shared: mission – their purpose for working together as a PLC; vision – a clear direction that they want to go; values – collective commitments; and goals – indicators, timelines and targets. Indicators, timelines and targets must be visible and available on paper to all the members at any time. Include multigrade content to foster the existence of multigrade as a structure. A checklist, based on indicators, timelines and targets, should be available to continually revise progress and to provide support. The assessment tool, to show that the implementation is effective, must be available for each project. Determine before the time who is going to assess the implementation, using the assessment tool.
	Collaborative culture with the focus on learning.	The team members work together interdependently to analyse and to impact professional practice in order to improve results for their learners, their team and their school.
	Collective enquiry into best practice and current reality.	The team members enquire together into best practice for their context. The team members make a candid clarification of their current practices. The team members make an honest assessment of their current practices. The collective enquiry into current reality should allow that the actual classroom of each member of a PLC must be visited and visually recorded. The recording should be shown to the other members at a meeting.
	Action orientation: learning by doing.	The team members turn their aspirations into action. The team members turn their vision into reality. The team members develop a deeper and more profound knowledge and greater commitment to learning by doing it. The team members implement their goals. Demonstrate what must be done in order for the members to see what they must do and learn from this demonstration before they try it out in the classrooms. An expert outside a PLC can also be invited to demonstrate the lesson. The demonstration must include and explain the measurement tool that is going to be used to determine if the implementation is effective. The 'learning by doing' in the classroom must include the application of the assessment tool during the implementation in order to support and guide the multigrade teacher and principal to be effective. Record (visually) the learning by first doing it in the classroom, and then showing it to the other teachers at a meeting.
	Commitment to continuous improvement.	The team members gather evidence. The team members develop strategies and ideas. The team members implement the strategies and ideas. The team members analyse the impact of changes/results. The team members apply the new knowledge in the next cycle of continuous improvement. All members must be trained before the research start to strengthen their analytical and application skills. The assessment of the first cycle of implementation must guide and support the indicators, timelines and targets for the next cycle of implementation. The assessment results must be available to every multigrade teacher and principal in a PLC to allow them to move to the next cycle. Ensure that the assessment report explains to each multigrade teacher and principal in a PLC: - What they have achieved. - What they still need to do. - What the best way is to do what still needs to be done. Determine beforehand if an expert, that is not a member of the PLC, is going to be used to assess and give feedback to the PLC.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

> "The answer to the knowing-doing problem is deceptively simple: embed more of the process of acquiring new knowledge in the actual doing of the task and less in the formal training programs that are frequently ineffective. If you do it, then you will know it" (Pfeffer & Sutton, 2000:27).

Providing multigrade teachers and principals with properly supported opportunities that support and guide the interaction and collaboration of multigrade teachers and principals, working together as a network cluster for collective learning and its implementation in their day-to-day user setting, is a major concern to the CMGE (Joubert, 2009). Teacher education for multigrade education in South Africa is poor and most multigrade teachers and principals involved in multigrade education have not received official training in multigrade education; in addition, they experience a lack of training in and support with multigrade education. Because of the extent of the problem experienced at each level involved with multigrade education in the education system in South Africa, chances are slight that support for multigrade teachers and principals will come from officials and curriculum advisers (Centre for Multigrade Education, 2009).

Unfortunately little evidence is available in the international scholarly literature relating to a process of support and preparation of teachers and schools as they gradually learn, come to understand, and become skilled and competent in the use of new ways, ensuring growth, improvement and support within a multigrade context. A reason for this is, according to Little *et al.* (2006:1), that in most countries teacher education for multigrade education either does not exist at all, is not embedded in their teacher education curricula, or the countries offer it as part of in-service training. Many of the in-service training programmes in multigrade education adopt a cascade model of dissemination and therefore are subject to many of the effectiveness issues that face cascade training programmes in general (Little, 2005:17).

Research (Aryal *et al*., 2003:12; Lingam, 2007:191; Mulryan-Kyne, 2007:505) shows that pre-service and in-service training does not encourage multigrade teachers and principals to develop a knowledge base, within the complexity of the actual classroom situation, and according to the problems that multigrade teachers want to solve, which would enhance their task as multigrade teachers and principals. Training can have an impact on the trainee-teachers but the transfer of this impact to the learners in the classroom is questionable. Therefore, how to bridge the gap, between newly acquired teacher competence and their performance in the classroom, is a major concern for the future (Suzuki, 2007:100).

This research examined how to bridge this gap between obtaining knowledge at a workshop and supporting and guiding multigrade teachers and principals to understand and address the dilemmas that emerge as they implement the new practices within their classrooms. This bridge that focuses on a process through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in the use of new methods.

During this research it became evident that, because support staff did not yet feel fully equipped to support and guide multigrade schools to bridge this gap, chances were negligible that support for and guidance to teachers would come from officials and curriculum advisers (discussed in Chapter 2). Therefore, a system was needed in which individuals could take the initiative in bridging the gap, with or without the help of others, in diagnosing their needs, formulating goals, identifying human and material resources, choosing and implementing appropriate strategies, and evaluating the outcomes.

A PLC provided the support system for multigrade teachers and principals to take the initiative to continuously transform themselves through their own internal capacity in order to bridge the gap. The characteristics of a PLC, anchored by relevant context-bound literature and research, provided the approach and process required in an intervention to increase support for and guidance to teachers and principals in bridging this gap, with the acknowledgement that a system is a set of related components that work together in a particular environment to achieve the system's objectives.

This final chapter concludes the research for this thesis. The research process is summarised in Section 8.1, followed by reflections on the conceptual framework (Section 8.2) and a summary of the research findings according to the research questions (Section 8.3). This is followed by reflections on the methodology (Section 8.4). The conclusions and recommendations are represented in Sections 8.5 and 8.6 respectively.

8.1 Summary of research process

The aim of this research was to identify and understand the characteristics of a Professional Learning Community, as a practical support system, and the utilisation thereof in order to provide multigrade teachers and principals with properly supported opportunities that support and guide the interaction and collaboration of multigrade teachers and principals, working together as a network cluster for collective learning and its implementation in their day-to-day user setting. The focus was on multigrade teachers and principals functioning as a PLC and implementation of collective learning in the classrooms. The research question and sub-questions were as follows:

What are the characteristics of a professional learning community as a means of supporting and guiding multigrade teachers and principals, working together in their day-to-day user setting as a network cluster for collective learning and its implementation in multigrade classrooms in South Africa?

1. What are the current needs, problems and challenges that multigrade teachers and principals face in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting?
2. What is a professional learning community and how has the concept developed?
3. What are the distinctive characteristics of a professional learning community?
4. What pre-existing conditions need to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that support and guide this interaction and collaboration?
5. How effective is the support system in practically supporting and guiding multigrade teachers and principals?
6. Which design guidelines for the development of an effective support system intervention for practically supporting and guiding multigrade teachers and principals can be identified?

This research aimed not only to generate and advance our knowledge of the characteristics of an effective support system (PLC), and develop well-articulated design principles and guidelines, but also to design and to develop a well-functioning practical support system for multigrade teachers and principals, based on the literature review and data generated through successive cycles of design, implementation and evaluation of the support system prototypes. In order to achieve the aims and objectives of this research educational design study, educational design processes that are cyclical in character were considered the most appropriate design to address the main research question. Formative evaluation was applied in order to uncover shortcomings of a prototype during its development process with the purpose to generate suggestions for improving it.

The results of the evaluation of each preceding prototype were used in the development of the next prototype.

The design research process for this research moved through two phases encompassing multiple design cycles:

- Preliminary Phase (one cycle): This phase focused on research sub-questions 1, 2 and 3:

1. What are the current needs, problems and challenges that multigrade teachers and principals face in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting?
2. What is a professional learning community and how has the concept developed?
3. What are the distinctive characteristics of a professional learning community?

Sub-question 1 was addressed in Chapter 2 by examining the concept 'multigrade education', the place of multigrade education in providing schooling for children in rural areas, the challenges of multigrade education, professional development for multigrade teachers and principals teaching in multigrade schools, how multigrade teachers and principals facing these challenges are supported, and the current needs, situation, problems and challenges in supporting multigrade teachers and principals in South Africa. Sub-questions 2 and 3 were addressed through a literature review (Chapter 3). The emphasis of this phase was to conceptualise the support system and to define the design specifications that formed the foundational principles and guidelines of Prototype 1, developed during this phase. The evaluative foci for this phase were relevance and consistency.

- Prototyping Phase (three cycles): This phase focused on research sub-questions 4 and 5:

4. What pre-existing conditions need to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that support and guide this interaction and collaboration?
5. How effective is the support system in practically supporting and guiding multigrade teachers and principals?

This phase consisted of the iterative research cycles during which Prototypes 2 and 3 of the support system were developed, implemented and formatively evaluated that led to the development of Prototype 4 (Chapters 5 to 7). The emphasis of the cycles shifted throughout the Prototyping Phase, focusing first on how to establish conditions for use in Cycles 1 and 2 (Chapters 5 and 6) and then on how to transform these conditions for use into action in Cycle 3 (Chapter 7). Cycles 1 and 2 concentrated on research sub-question 4 with the evaluations concentrating on relevance, consistency and practicality. Cycle 3 examined research sub-question 5 with the evaluative foci of actual practicality and expected efficacy.

The design research approach for this research incorporated various combinations of qualitative and quantitative methodologies during evaluation of the prototypes. The data from each evaluation served to develop design principles and guidelines to inform the

development of the next prototype. In the next section the conceptual framework is discussed as it framed this investigation.

8.2 Reflections on the conceptual framework

When examining support for and guidance to teachers in implementing change in their classrooms, it is important to realise that the use of a support system is more than discrete innovations or programmes, usually developed by an external source and presented to teachers and schools as a packaged product, or giving teachers a box of curriculum material (Hall *et al*., 2006; Hord *et al*., 2006:1; Hall & Hord, 2011:5). It is an approach that acknowledges that a system is a set of related components that work together in a particular environment to achieve the system's objectives. The conceptual framework in this research employed a system theory approach that treats a problem from a wide perspective by taking all the components into consideration and focusing on the interactions between the components of this problem (Hamilton 1997).

The conceptual framework for use in this research was developed from the literature on PLCs, implementation of an educational innovation, and supporting teachers and principals in creating and sustaining effective PLCs. The framework acknowledged the interaction between various components in the support system that influence how multigrade teachers and principals are supported and guided and how likely it is for the support system to be used appropriately in a process through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in the use of novel methods in their classrooms. The original framework is shown in Figure 8.1.

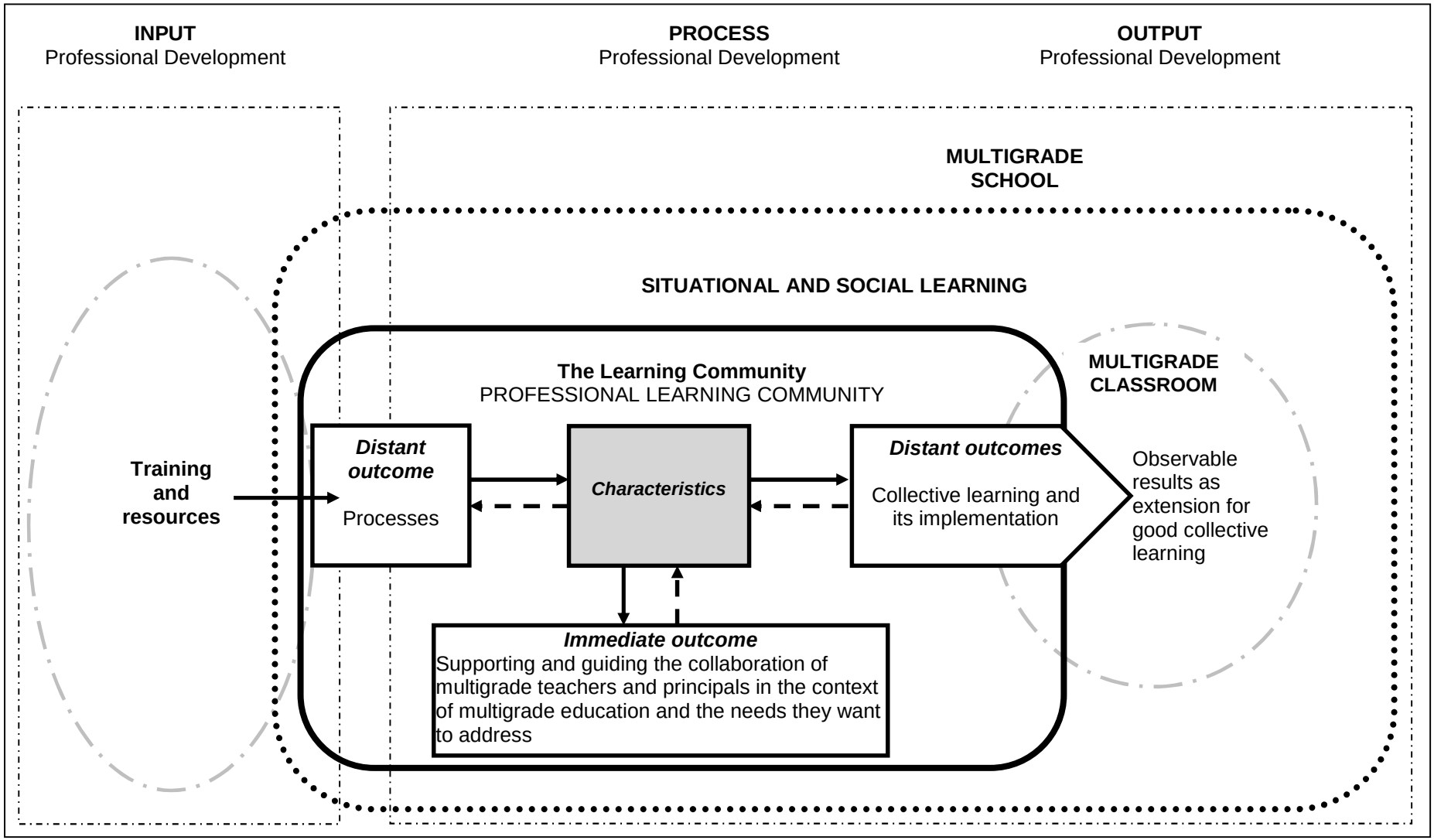


Figure 8.1: Original conceptual framework of teachers operating as a Professional Learning Community

The conceptual framework is a nested system acknowledging that the components of the support system, characterised by substantive and approach elements, are organised in a meaningful way to process or convert information (inputs) into a product or outcome, for use within the system or outside the system or both, to accomplish an overall goal (Friedman & Allen, 2011:5). Support and guidance are influenced by the interaction of the multigrade teachers and principals with the characteristics of a PLC and the feedback that the support system uses to evaluate and monitor the system and guide it to more effective performance. What happens inside the system is somewhat mysterious and one can only measure the changes by observing the outputs in relationship to the outcomes or goals of the system (Friedman & Allen, 2011:5).

Based on what is learned during the influence of the interaction, with the characteristics of a PLC and the feedback that the support system uses to evaluate and monitor the system, an enlargement of the body of knowledge first takes place. The information is then viewed through a multigrade education lens and then tested for reasonability and feasibility before it results in implementation and observable results in the multigrade classroom. Every time use and participation in the support system take place, the support and guidance culture and experience of the multigrade teachers and principals change, according to the needs they want to address and influence following cycles of support, guidance and use.

In view of these results, further adaptations were made to the final conceptual framework. The final conceptual framework for supporting and guiding the collaboration of multigrade teachers and principals is shown in Figure 8.2. In the original conceptual framework, it was conceptualised that the PLC characteristics are the processes acting upon supporting and guiding the collaboration of multigrade teachers and principals in the context of multigrade education and addressing their needs, and that collective learning of what needs to be done (knowledge) to result in action or behaviour (implementation) that is consistent with that knowledge in the actual classroom was seen as a distant outcome.

Through the course of this research, it became clear that supporting and guiding what needed to be done (knowledge and skills) were seldom a concern, but supporting and guiding the level of use (Table 3.3 in Chapter 3) and behaviour (implementation) that are consistent with that knowledge in the actual classroom were hindered when the multigrade teachers and principals in the PLCs felt that they could not commit to continuous improvement without first obtaining feedback of their observable level of use, that was consistent with that knowledge in the actual classroom.

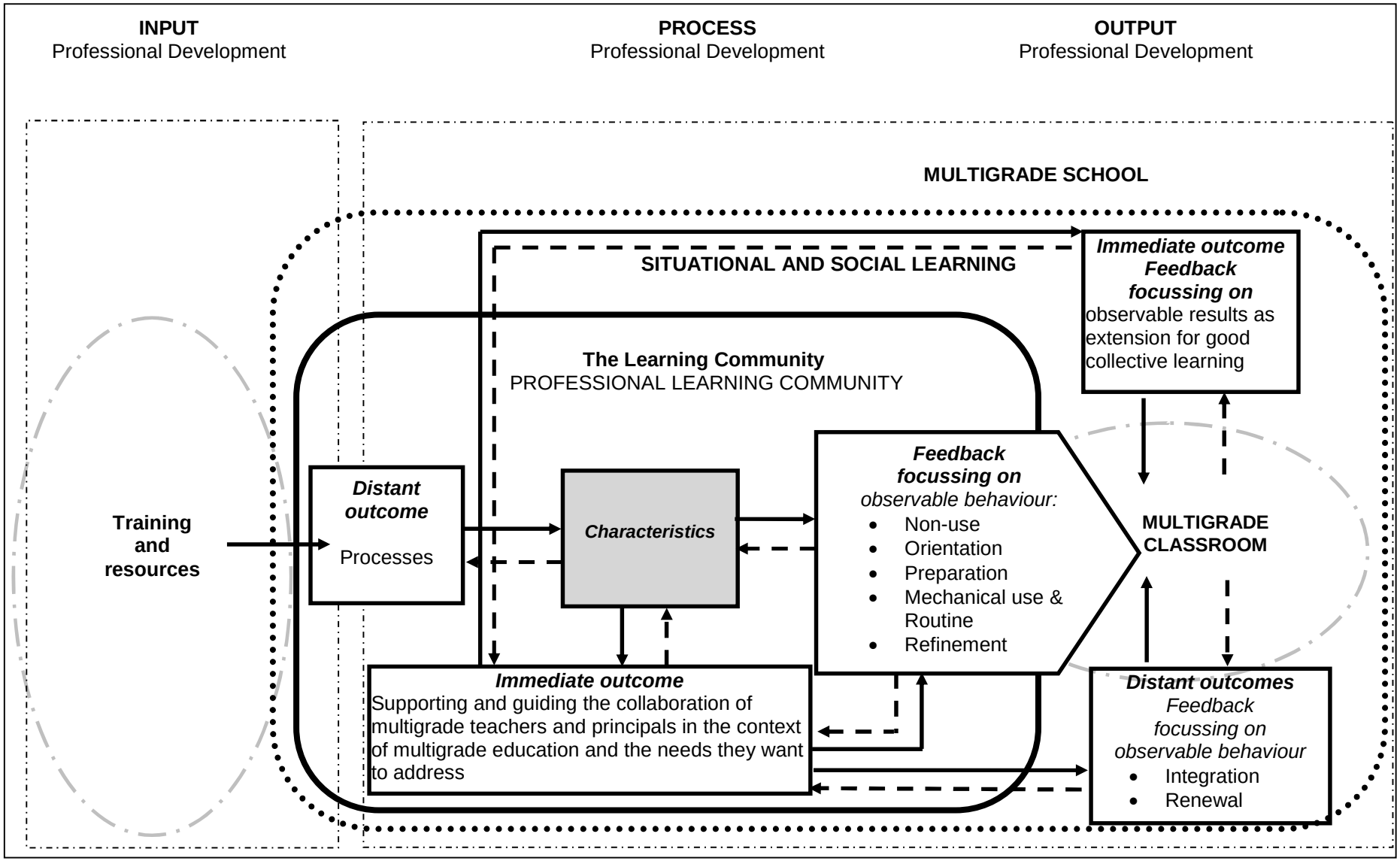


Figure 8.2: Conceptual framework for supporting and guiding the collaboration of multigrade teachers operating as a Professional Learning Community

Because the multigrade teachers and principals in the PLCs had to wait for feedback of their observable level of use that was consistent with that knowledge in the actual classrooms, from a source outside their PLCs, this contributed to the fact that the support system therefore failed the feasibility test in providing feedback to the members of the PLCs of their level of use (observable behaviour) in the actual classrooms. After deliberation with the PLCs and multigrade teachers and principals, it was determined that although the characteristics of the PLC did:

- create a context supportive of change;
- provide time for collaboration;
- identify the critical questions that should guide the work of the PLCs;
- develop, articulate and communicate a shared vision of the intended change;
- plan and provide resources;
- invest in professional learning;
- guide the PLCs to create products as a result of their collaboration;
- check the progress of obtaining knowledge and skills (what needs to be done);
- provide the PLCs with relevant data and information on what needs to be done; and
- provide continuous assistance for what needs to be done,

they were not confident that they were successful in the implementation of the five pedagogic activities in their classrooms and had to rely on the assessment and feedback of an external assessor – even after they had been trained in the five pedagogic activities and had the predetermined checklist with a criterion for each of the five pedagogic activities in their possession (discussed in Section 7.2.1.4 and Figures 7.3 to 7.6 in Chapter 7).

The process of providing feedback of their level of use (observable behaviour) in the actual classroom to the multigrade teachers and principals was prevented by (Table 8.1):

- the multigrade teachers and principals that focused most of their preparation and effort on the short-term, day-to-day first use (mechanical use and routine) of the innovation with little time for reflection; and
- the observable behaviour of each level of the LoU (Table 8.1) that were not assessed by the PLCs themselves to determine if teachers had mastered a specific level and were ready to progress to the next level of the LoU.

Table 8.1: Level of use - observable behaviour (Adapted from Hall *et al.*, 2006:5-7; Sweeny, 2010:3)

KNOWLEDGE and ACTION						
Unrelated	Self		Task	Impact on learners and in classroom		
Level of use: observable behaviour (LoU)						
Non-use	Orientation	Preparation	Mechanical use and Routine	Refinement	Integration	Renewal
User's development in acquiring new skills and varying use of the innovation						
State in which the user has little or no knowledge of the innovation, has no involvement with the innovation and is doing nothing to become involved.	State in which the user has acquired or is acquiring information about the innovation and/or has explored its value orientation and its demands upon the user and the user/system.	State in which the user is preparing for the first use of the innovation.	State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than clients' needs.	State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence.	State in which the user is combining own efforts to use the innovation with the related activities of colleagues to achieve a collective effect on clients within their common sphere of influence.	State in which the user re-evaluates the quality of the use of the innovation, seeks major modifications or alternatives to present innovation to achieve increased impact on clients.

An additional component was thus included in the conceptual framework. The support system was expanded to include a feedback component of level of use (observable behaviour) as a related component to the other components in the support system to ensure that the support system had a feedback mechanism that could ascertain whether the outputs, with regard to the level of use (observable behaviour), of the system were what they should be and to ensure that they were self-regulating.

This shift meant that the process of support and guidance for multigrade teachers and principals did not end with the guiding principles (characteristics) of the PLCs that supported the opportunities to collaborate and interact with one another. It also included and provided diagnostic dimensions designed to support and guide the facilitation of the implementing of an educational innovation, and particularly focused on supporting teachers. These diagnostic dimensions helped facilitators to identify the special needs of individuals involved in the implementation and change process and to support and address those needs appropriately based on information gathered through the model's diagnostic dimensions, identifying what teachers were doing or not doing in relation to the innovation.

The contribution of this conceptualisation to the scientific body of knowledge on support systems for multigrade teachers and principals is that implementation can be influenced by the lack of or poor feedback, focusing on the performance of the individual as he/she progresses through the implemented LoU of an innovation and becomes competent in its use.

Through an approach of feedback (focusing on observable behaviour of the individual, working together as a network cluster for collective learning and its implementation), support for and guidance to multigrade teachers and principals of what needs to be done (knowledge) to result in action or behaviour (implementation) that is consistent with that knowledge in the actual classrooms can be influenced. To increase the impact on learners within the immediate sphere of influence in multigrade classrooms, the feedback should be extended to the understanding and interpretation of data to enable multigrade teachers and principals to be supported and guided to transform what needs to be done (knowledge) to result in action or behaviour (implementation) that is consistent with that knowledge in the actual classrooms.

8.3 Summary of results

The research results are presented in this section with specific reference to each research sub-question that was addressed. Reference is made to the chapters in which the full results for each sub-question can be found.

The overall research question for this study is:

> What are the characteristics of a professional learning community as a means of supporting and guiding multigrade teachers and principals, working together in their day-to-day user setting as a network cluster for collective learning and its implementation in multigrade classrooms in South Africa?

In order to address the overall research question, a number of specific sub-questions were explored. In this research, six specific questions were employed to answer the main research question. Each question and the relevant results are summarised separately.

8.3.1 Sub-question 1

> What are the current needs, problems and challenges that multigrade teachers and principals face in multigrade schools in South Africa, working together as a network cluster for collective learning and its implementation in their day-to-day user setting?

Sub-question 1 was addressed in preparation for the Preliminary Phase. In order to improve the current situation, and to provide multigrade teachers and principals with properly supported opportunities in South Africa, the stage they were at, or the level at which they were experiencing difficulty, had to be identified. The question was addressed by documenting the challenges of multigrade education and professional development that teachers and principals in multigrade schools were facing and how they were supported (Chapter 2).

The literature review (discussed in Chapter 2) made it clear that multigrade education in South Africa showed a resemblance to the chain of problems experienced internationally. Furthermore, it exposed the lack of support and support systems that were still not addressed in South Africa and exposed the extent of the problem and the specific needs (Table 2.9 in Chapter 2) of the role-players at each level involved with multigrade education in South Africa.

The main support component of the MGRSI for teachers in multigrade schools was situated in the cluster teams. However, it seems that any successful support system cannot solely rely on the underlying programme theory or 'theory of change' of the intervention, but necessarily has to:

- provide the characteristics or validated principles ('how to do' guidelines or heuristics);
- clarify how the teachers and principals must function if they are involved in a specific support system or show the cause-and-effect relationships between the activities and the outcomes for the teachers and principals involved; and
- indicate how clustering and decentralisation support the teachers and principals, as active participants involved in their own learning and understanding in the complexity and context of the actual classroom situation of the teachers and principals and according to the needs they want to address.

8.3.2 Sub-questions 2 and 3

What is a professional learning community and how has the concept developed?

What are the distinctive characteristics of a professional learning community?

The Preliminary Phase of the research design examined the characteristics documented in literature of professional learning communities, with particular attention given to the basic dimension of effective professional learning communities as a model committed to continuous support and guidance for all in order for them to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones on

their improvement journey (Chapter 3). This model endorsed three distinctive themes: 1) a solid foundation consisting of a collaboratively developed and widely shared mission, vision, values and goals, 2) collaborative teams that worked inter-dependently to achieve common goals, and 3) a focus on results as evidenced by a commitment to continuous improvement. Embedded within these three themes the following six characteristics formed a solid foundation for collaborative teams to work inter-dependently to achieve common goals, based on a shared mission, vision, values and goals, and focused on results as evidenced by a commitment to continuous improvement:

- Characteristic 1: Supportive and shared leadership
- Characteristic 2: Shared mission, vision, values and goals
- Characteristic 3: Collaborative culture with the focus on learning
- Characteristic 4: Collective enquiry into best practice and current reality
- Characteristic 5: Action orientation: learning by doing
- Characteristic 6: Commitment to continuous improvement

The characteristics of a PLC acted like a road map or steps, supporting and guiding teachers and principals as active participants involved in their own learning and understanding in the complexity and context of the actual classroom, and specifying what they should do.

8.3.3 Sub-question 4

> What pre-existing conditions need to be established in the support system to facilitate the process of providing multigrade teachers and principals with properly supported opportunities that support and guide this interaction and collaboration?

This research question was addressed during the Prototyping Phase, employing a literature and research review of a PLC, a review of the MGRSI, a review of a case study (Boonzaaier, 2008), a review of a baseline study (Centre for Multigrade Education, 2009), a focus group interview and questionnaire (n = 7), a walkthrough (n = 7), a micro-evaluation (n = 7), a second walkthrough (n = 7) and an expert appraisal (n = 3), discussed in full in Chapters 5 and 6, and a second micro-evaluation (n = 60), discussed in full in Chapter 7. The research revealed that the following eight components needed to be considered to have a successful support system:

1. Situational and social learning

   A social alliance, which entertains situational learning by placing the reasoning capacity of the teachers and principals in a specific place, involving all teachers and principals of schools.

2. Multigrade teachers and principals plan and work together in a PLC

   Teachers and principals of multigrade schools in South Africa must provide and create, by planning and working together in a PLC, their own infrastructure and platform for deliberate planning and working together.

3. Supportive and shared leadership

   This enhances shared leadership capacity in order to empower all members of a PLC to share in the vision and mission and to make effective decisions that positively affect learning and achievement.

4. Shared mission, vision, values and goals

   Specifies what teachers and principals will start doing today to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones on the improvement journey.

5. Collaborative culture with the focus on learning

   A collaborative culture with the focus on learning acts as the strategic vehicle that allows teachers and principals in multigrade schools to reduce teacher isolation and to create new ideas that come from themselves, and to be involved in their own learning, meaning and understanding of the new strategy with the necessary follow-through or support to implement the innovation or new strategy.

6. Collective enquiry into best practice and current reality

   Engages and supports the members of a PLC in collective enquiry into (1) best practice about teaching, (2) a candid clarification of their current practices, and (3) an honest assessment of the teachers' and principals' learning to move beyond discussions and to help them to focus on areas that can contribute to significant improvement.

7. Action orientation: learning by doing

   Provides and serves as the 'fuel' for a PLC to take action in describing the behaviours that are required by an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation.

8. Commitment to continuous improvement

   Analyses the impact of the changes and applies the new knowledge in the next cycle to enhance continuous improvement.

8.3.4 Sub-question 5

How effective is the support system in practically supporting and guiding multigrade teachers and principals?

This question relates not only to the actual practicality of the support system, in supporting and guiding multigrade teachers and principals, working together in their day-to-day user-setting as a network cluster for collective learning and its implementation in their classrooms, but also relates to examples of expected and actual efficacy. The actual practicality and efficacy were examined in a second micro-evaluation through observer-as-participant observation (n = 2), structured observation (n = 58) and standardised open-ended focus group interviews (n = 4), involving 60 teachers in 24 schools – working together as a network cluster for collective learning in four PLCs (see Chapter 7 for a full discussion).

The data from the observations and interviews revealed that the components of the support system did practically support and guide the interaction and collaboration of multigrade teachers and principals in a cluster (PLC) as active participants involved in their own learning and understanding in the complexity and context of the actual classroom situation of the teachers and principals and according to the needs they wanted to address. The components provided 'how to do' guidelines or heuristics that supported the collaboration, collective learning and its implementation for teaching at classroom level. They acted like a road map, illustrating the way for members of a PLC to get from point A to point B – guided by established clear benchmarks of progress and milestones on their improvement and support journey in their context and for the needs they wanted to address.

During the observations it became clear that the design principles and guidelines of the support system were very practical and effective in supporting and guiding multigrade teachers and principals. During the interviews the multigrade teachers and principals generally expressed the same views. The design principles and guidelines created a platform for them to talk to one another about the issues, to clarify what the expectations were and to

see things in perspective. It also served as a bridge between external actors (training and officials of the District Office) and reality, and helped to reconcile expectations with reality. The observations and interviews also made it clear that the design principles and guidelines of the support system did not just support and guide the multigrade teachers and principals to function as PLCs, but they also supported and guided the multigrade teachers and principals to practically implement the pedagogic activities (Table 7.3 in Chapter 7) in their multigrade classrooms.

The fact that the multigrade teachers and principals were not confident of their success in the implementation of the five pedagogic activities in their classrooms, and had to rely on the assessment and feedback of an external assessor, hindered the actual practicality and expected effectiveness of the support system in providing support and guidance (discussed in Section 8.2).

The final research question is dealt with in the following section and relates to the design guidelines for the development or adaptation of an effective support system.

8.3.5 Sub-question 6

> Which design guidelines for the development of an effective support system intervention for practically supporting and guiding multigrade teachers and principals can be identified?

Design principles and guidelines were required to identify the characteristics of an effective support system to address the main research question and contribute to the body of knowledge. In order to provide a basis for transferability of this research to different multigrade contexts in South Africa, design principles and guidelines were identified from the design research process for use in other multigrade contexts. Design guidelines were developed throughout the two phases of the design research process, based on the various evaluations. The design guidelines were clustered according to the design principles of a PLC (Table 7.5, Chapter 7).

8.4 Reflections on methodology

In this research the use of a design research approach was highly effective for the design of the support system. In researching what people experienced in context or *in situ* and to observe how the people behaved when absorbed in genuine life experiences in the real-world setting, the design research approach allowed the opportunity to design, implement and evaluate various prototypes, which slowly started to approximate the ideal for the specific context of multigrade education.

Furthermore, the design and development activities included representatives of the target users (multigrade teachers and principals) in designing the interventions. For this research this meant:

- in the cyclical process, selecting and using multigrade teachers and principals to help answering the research questions in a real world setting;
- more accurate information about the task in the cyclical process, in a specific multigrade context, were obtained;
- more intensive discussion about the requirements and support to address the specific needs of the multigrade teachers and principals involved in each phase in this research;
- better structured and more opportunities to negotiate and justify design ideas to address and suit their specific needs in each phase;
- increased commitment, ownership and willingness of the multigrade teachers and principals to apply the final product in their teaching; and
- professional growth and involvement of the participants.

The design research approach also allowed for the use of multiple methods, different assumptions, as well as different forms of data collection and analysis that allowed for knowledge claims that arose out of actions, situations and consequences that were based on what worked at the time and solutions to specific problems for multigrade teachers and principals in South Africa. It also helped to locate shortcomings in the intervention and to generate suggestions for improvement leading to more robust results. Furthermore, by using multiple methods, and different assumptions, as well as different forms of data collection and analysis, it compensated for the weaknesses in the data by the counterbalancing strength of another. The triangulation, by using different types of persons, different times, and different places, enhanced the reliability and internal validity of the findings of this research.

The design research approach also employed an evolutionary prototyping approach that allowed:

- for investigating reality to transform in their day-to-day working environment;
- for the search for new and innovative solutions for problems, while also seeking findings that were transferable, practical and socially responsible;
- for a cyclical process, encompassing a series of specific activities and for the evaluation data from the previous cycles to inform planning and design of the next prototype; and

- the researcher to reduce the experience of the multigrade teachers and principals to a central meaning, to enter the subjects' 'life world' or 'life setting' within multigrade education and to place himself in their shoes.

In this research, the researcher was not a cultural stranger in the multigrade education environment. However, design research helped to overcome the ethical concern regarding the relationships established by a researcher when conducting participant observation. Their questions about the research and my presence were put to rest and helped to establish a relationship that made multigrade teachers and principals comfortable with the interaction and me being there.

"We're glad that you, who are also a teacher and a principal, are working with us and not someone from the department. You understand our situation. We can now talk to someone – in the past we did not know with whom to talk and we did not ask questions of someone we did not know. Now we know each other and it makes it easier for us to share problems with each other" *(*Teacher in school 7 in PLC B, Appendix F*).*

The design research approach also helped the researcher during participant observation to identify another factor that could influence the interaction and collaboration of multigrade teachers and principals. Multigrade teachers and principals were exposed to interventions that did not work for them in a multigrade context over a period of ten years, interventions developed for monograde education that ignored the existence of multigrade education or did not address their specific needs in context.

"For a period [of] over ten years we had to participate in interventions that did not work for us in multigrade schools. Therefore we came with our baggage to this intervention and that made us very pessimistic" (Teacher in school 7 in PLC B, Appendix F).

"For me it was a forum, a place where we shared everything with each other. I was very negative with the previous intervention, but co-operation in a PLC changed my beliefs in the fact that certain things were the only solution for operating in a multigrade classroom, but I was not sure how to apply it. I have gained a new insight with respect to multigrade education" (Participant 1, Table 4.7 in Chapter 4).

8.5 Conclusions

Seven major conclusions were generated from the research results of this study:

1. An optimal PLC support system positively influences the interaction and collaboration of multigrade teachers and principals with properly supported opportunities in working together as a network cluster in a multigrade context.

This research shows that a PLC support system can positively mediate and influence the interaction and collaboration of multigrade teachers and principals with properly supported opportunities to work together as a network cluster in bridging the gap. The data from the observations and interviews revealed that the components of the support system did practically support and guide the interaction and collaboration of multigrade teachers and principals in a cluster (PLC) as active participants involved in their own learning and understanding in the complexity and context of their actual classroom situation and according to the needs they wanted to address. This was firstly accomplished by providing the design principles and guidelines of a PLC, supporting and guiding them with the steps that needed to be followed for them to create their own infrastructure and platform for deliberate planning and working together to share their prior knowledge and experience as well as their experience with regard to the implementation of the new knowledge. Secondly, a PLC support system supported and guided the multigrade teachers and principals to work and plan for a period of time on their own without the help of an external source.

In this research, when multigrade teachers and principals plan and work together as a network cluster, two processes are important. The first process comprises the steps that need to be followed to function as a PLC. The second process comprises the steps according to the indicators, timelines and targets identified by a PLC, in other words, their specific needs in their unique multigrade context. Both processes must be monitored on a regular basis to ensure that the processes proceed incrementally, or to rectify dysfunctional PLCs. This conclusion relates to research sub-questions 4 and 5, Chapters 6 and 7.

2. An effective PLC support system facilitates appropriate and practical support for and guidance to multigrade teachers and principals to convert or process information (input) through a gradual process, through which they move as they gradually learn, come to understand, become skilled and competent in the use of the new ways, into a product or outcome for use within their multigrade classrooms.

This research shows that appropriate support and guidance in a PLC support system is not facilitated by a single event or component in a PLC support system, but through the interaction of the various components of the system and repeated exposure of the users to support and guidance. The design principles and guidelines created a platform for the multigrade teachers and principals to talk to one another about the issues, to make it clear what the expectations were and to see things in perspective. It also served as a bridge between external actors (training and officials of the District Office) and the reality of the multigrade teachers and principals, and could reconcile their expectations with reality. The design principles and guidelines of a PLC support system did not just support and guide the multigrade teachers and principals to function as PLCs, but they also supported and guided

them to practically implement the pedagogic activities (Table 7.3 in Chapter 7) in their multigrade classrooms.

In order to convert or process information (input) successfully through a gradual process, a PLC support system must be flexible and responsive to the specific needs and unique context of multigrade teachers and principals. The multigrade teachers and principals are the true experts in their own context, and information is first viewed through their multigrade education lens and then tested and demonstrated for reasonability and feasibility before it results in implementation and observable results in their multigrade classrooms. In the process of first testing and demonstrating for reasonability and feasibility, the multigrade teachers and principals took ownership, came to understand what they had to do and became skilled and competent in the use of these innovations within their multigrade classrooms. In involving them in the development or contextualisation of each component of the gradual process, it helped to establish the credibility of the support and guidance, based on their unique needs and challenges for each component, and to produce a final product suitable for implementation within their unique context. This conclusion relates to research sub-questions 4 and 5, Chapters 6 and 7.

3. An effective PLC support system mediates thinking and understanding of multigrade education and pedagogy among multigrade teachers and principals and supports and guides them to address the challenges they encounter within their unique multigrade context.

The concept of multigrade pedagogy is quite challenging for untrained multigrade teachers and principals or multigrade teachers and principals trained in a monograde pedagogy, consequently they find multigrade education difficult (Juvane, 2005:10; Lingam, 2007:191; Mulryan-Kyne, 2007:504; Khan & Khan, 2008:1). It is evident that the problem is more than just that teaching in a multigrade classroom requires a pedagogy that is different from monograde pedagogy. Multigrade teachers and principals should be provided with adequate knowledge of and training on how to handle several grade levels simultaneously. Therefore training and in-service teacher education programmes need to prepare, guide and support multigrade teachers and principals to build a knowledge base that enables them to have a thorough understanding within the complexity of the actual classroom situation and to help them use a variety of teaching strategies in a multigrade context (Lingam, 2007:187).

Instead of having a possible solution imposed upon them, generated by an external source, teachers should be allowed to create, as active participants, new knowledge and should be given the opportunity to be involved in their own learning, creation of meaning, and understanding of the new strategy with the necessary follow through or support to implement

the innovation or new strategy. Therefore the process of delivery and the execution of the pedagogy must take the process, through which the teachers and schools move as they gradually learn, come to understand and become skilled and competent in the use of the new methods, into consideration.

In this research a PLC support system provided an opportunity for multigrade teachers and principals to be involved in their own learning, creation of meaning and understanding of the new strategy with the necessary follow through or support to implement the innovation or new strategy. This helped them to determine the pedagogy (the act or science of teaching, that is, what a teacher needs to know and the skills a teacher needs to command in order to make and justify the many different kinds of decisions of which teaching is constituted.

They used the knowledge (knowledge for the practice that suggests a possible solution to a generic situation without taking the unique situation of the teacher into account) obtained at the workshop and compared it with their own practical knowledge of the situation in their own multigrade classrooms (knowledge in practice). Through functioning as a PLC support system, knowledge of the practice was obtained from data from their systematic enquiry, questions and demonstrations in order for the members to see what they had to do and learned from the demonstration before they attempted it in their classrooms. This helped them to determine which factors had a positive or a negative effect on implementation in multigrade classrooms (Dana & Yendol-Hoppey, 2008:2-3). This research allowed the multigrade teachers and principals to be part of the research process in identifying and analysing the problems and they were given the opportunity to create their own meaning, learning about and understanding of the new strategy or intervention.

A PLC support system also helped to reduce their feelings of isolation and that there was nobody that could help them with their challenges and needs within the multigrade context. The PLC helped them to see things in perspective and to realise that other multigrade teachers and principals suffered the same hardships that they did. This conclusion relates to research sub-questions 4 and 5, Chapters 6 and 7.

4. An effective PLC support system offers an appropriate and powerful approach for 'learning by doing' that is tested for reasonability and feasibility before it results in implementation and observable results in the multigrade classroom.

For learning to become job-embedded, teachers need to engage in collective enquiry into both best practices regarding teaching and learning as well as the reality of the current practices and conditions in their schools. This involves 'learning by doing', reflecting on the experience and then generating and sharing new insights and learning with oneself and others (Huffman & Hipp, 2003:10). As they do that, they are clarifying what an innovation is,

understand what the change is all about and it helps them to identify and understand the new concepts. This interactive and iterative process is guided by focusing on three questions: (a) What does the innovation look like when it is in use? (b) What will I see in classrooms where it is used well (and not used well)? and (c) What will teachers and learners be doing when the innovation is in use? (Roy & Hord, 2004).

In this research a PLC support system supported and guided the multigrade teachers and principals to collectively enquire into best practices regarding teaching and learning as well as the reality of the current practices and conditions in their schools. Based on their enquiry, reflection and experience, their new insights and learning were first practically demonstrated by an experienced and knowledgeable (in that specific topic) member of their PLC in order for the other members to see what they had to do and to learn from the demonstration before they tried it out in their classrooms. This helped them to focus on the above-mentioned three questions. It also helped them to adapt the generic multigrade education methods (Table 7.3 in Chapter 7), received at the first workshop from an external source, to their specific phase and grades that they were teaching in multigrade classrooms.

In this research the practical demonstrations took place during the meetings of the PLCs in a classroom at a multigrade school. Owing to barriers unique to multigrade schools (far distances to travel between schools and expenses; learners that had to travel by bus and who were not available after school hours for demonstration lessons; the fact that the teachers couldn't leave their classrooms with learners unattended to visit other schools during school hours; insufficient staff at a school to have a substitute teacher, allowing the class teacher to visit another school, discussed in Section 7.2.1.4 in Chapter 7), the multigrade teachers and principals involved in this research could not experience what the learners would be doing when the innovation was implemented. To address this challenge a practical demonstration can be conducted and visually recorded in a real classroom situation with learners present and then shown to the other members at a meeting. This can contribute to the reasonability and feasibility of 'learning by doing' before it results in implementation and observable results in the multigrade classroom. This conclusion relates to research sub-questions 4 and 5, Chapters 6 and 7.

5. An effective PLC support system must offer clear, simple and easy to use and understandable feedback to multigrade teachers and principals of their level of use, which is consistent with that knowledge in the actual classroom.

Throughout the course of this research, it became clear that supporting and guiding what needs to be done (knowledge and skills) were seldom a concern for the multigrade teachers and principals, but supporting and guiding the level of use (Table 3.3 in Chapter 3) and

behaviour (implementation) that are consistent with that knowledge in the actual classroom were hindered when the multigrade teachers and principals in a PLCs felt that they could not commit to continuous improvement without first obtaining feedback of their level of use. They were not confident that they were successful in the implementation of the five pedagogic activities in their classrooms and had to rely on the assessment and feedback of an external assessor – even after they had been trained in the five pedagogic activities, had demonstrated the adapted activities, according to their needs and unique contexts, and had the predetermined checklist with a criterion for each of the five pedagogic activities in their possession (discussed in Section 7.2.1.4 and Figures 7.3 to 7.6 in Chapter 7).

Every time use and participation in the support system take place, the support and guidance culture and experience of the multigrade teachers and principals change, according to the needs they want to address at a specific component of the support system of LoU (Table 8.1), and influence following cycles of support and guidance, and use. According to Sweeny (2010:3), if the teachers' needs are not addressed at the stage they are at or at the level they are experiencing difficulty, they become stuck at some lower level or will use or adopt coping strategies which are often poor practice – this then leads to a disconnection between knowledge and action on teacher-learning and use.

A PLC support system must therefore include a feedback mechanism that provides clear, simple and easy to use and understandable feedback to multigrade teachers and principals that can ascertain whether the outputs, with regard to the level of use (observable behaviour) of the system, are what they should be and to ensure that it is self-regulating (discussed in Section 8.2). It must also provide feedback to increase the impact on learners within the immediate sphere of influence in multigrade classrooms, focusing on refinement, integration and renewal (Table 8.1). This conclusion relates to research sub-question 5, Chapter 7.

6. An effective PLC support system for multigrade teachers and principals depends largely upon leadership that is passionate about multigrade education, has knowledge of multigrade education, and is experienced in multigrade education.

Hall and Hord (2011:146) argue that innovation-related interventions, change facilitation support and assistance may be delivered by any person who assumes the role and responsibilities of the change facilitator. This was not always the case in this research with each person who assumed the role and responsibilities of the leader (facilitator) in each of the PLCs.

In this research the leadership of the PLCs was predetermined and selected by an external source and was not democratically elected or selected by the multigrade teachers and principals present in the PLCs. It became evident in this research that where the supportive

and shared leadership did not function according to the design principles, the effect of this was visible in the observable behaviour of the multigrade teachers and principals in the PLCs and the implementation of the activities in the classrooms.

In the Prototyping Phase in Cycle 1, the seven multigrade teachers and principals (Table 4.7 in Chapter 4) could not convert information (inputs) into an outcome or a product (to construct a manual for multigrade principals in South Africa). The following factors hampered supported and shared leadership during Cycle 1 of the Prototyping Phase:

- Only one of them tried or was prepared to share the leadership in supporting and guiding the PLC through six steps in order to create a product. This could be because they were not trained as potential leaders of a PLC or were not experienced and competent enough to take a leadership role, in spite of their being appointed as leaders of their schools.
- The multigrade teachers and principals viewed shared leadership as the time when a member of a PLC was talking to the group (discussed in Section 6.2.2.5 in Chapter 6).
- Although they were all principals and responsible for leading the teachers at their schools in delivering the curriculum as a product to the learners at the schools, in delivering a product by learning by doing (design principle – action orientation: learning by doing), the participants either just started to stay away from meetings, did not do their share of the work, or if they missed the due date of handing in their share of the work, made no effort to hand it in at a later stage.

In the Prototyping Phase in Cycle 3 all four of the PLCs used the same design principles and guidelines of support Prototype 3 to practically support and guide the multigrade teachers and principals in the PLCs to plan and work practically together in order to determine and transfer their PLCs' own unique indicators, timelines and targets to the classrooms. A website (www.multigraadcluster.weebly.com) was also created by the researcher, as an additional tool, to enhance supportive and shared leadership between all the PLCs involved in this research. All PLCs were asked to communicate information about their meetings and progress on this website to allow the leaders and members of the other PLCs to share this information and to support and guide them in their own efforts.

During the interviews only the members of PLC A, B and C complimented the leaders of their PLCs for the roles they had played in supporting and guiding them to successfully function as PLCs and implement the criteria in their classrooms. The total ratio of implementation of all the multigrade teachers and principals of the PLCs that complimented their leaders for the roles they had played in supporting and guiding them, were overall better than the PLCs

where the leaders did not have the co-operation of all the members or were not complimented for the roles they had played.

The means plot (Figure 7.7 in Chapter 7) of all the PLCs shows that PLC A differs from PLC D with regard to the implementation of the criteria in a multigrade classroom. The difference is also evident in the comparison between the total ratio of implementation of all the multigrade teachers and principals in PLC A (Figure 7.3 in Chapter 7) with the total ratio of implementation of all the multigrade teachers and principals in PLC D (Figure 7.6 in Chapter 7). The significant differences between PLCs A & B, based on observations (observer-as-participant) and interviews, were that:

- PLC A had a very competent leader that also took it on himself to support, guide and assist the leaders of the other PLCs; and
- some of the schools in PLC D refused to attend the PLC meetings or did not give their co-operation to the PLC leader, and the fact that PLC D could only meet twice with only some of the members present, as a PLC, during the five months (Table 7.4 in Chapter 7). The leader of PLC D therefore could not:
    - empower all members in the PLC to share in the vision and mission and to make effective decisions that positively affect learning and achievement;
    - build internal capacity for leadership among the team members;
    - share the responsibility for leadership among the team members;
    - create a context supportive of change;
    - provide time for the team to collaborate;
    - identify critical questions that should guide the work of the collaborative team;
    - guide the team to create products as a result of their collaboration;
    - plan and provide resources for the team;
    - provide the team with relevant data and information;
    - check the team's progress;
    - provide continuous assistance to the team and the team members; and
    - contact the members of the PLC between steps to monitor individuals' progress and to encourage them; and ensure that the administration (minutes of every meeting and indicators, timelines and targets) was recorded on paper and available to every multigrade teacher and principal in his PLC.

This conclusion relates to research sub-questions 4 and 5, Chapters 6 and 7.

7. Design research offers an appropriate and powerful approach to obtain, within the real-life setting of multigrade teachers and principals, clear, simple and easy to use and understand feedback to all role-players involved in multigrade education in order to provide the appropriate support and support systems.

Finally, throughout this research, the importance of a personal action which is grounded in a process in which individuals in multigrade education take the initiative, with the help of others, in diagnosing their needs, formulating goals, identifying human and material resources, choosing and implementing appropriate strategies and evaluating the outcomes, has been emphasised. Design research is an effective method of developing various prototypes in collaboration with multigrade teachers and principals to ensure contextual appropriateness of what works at the time and solutions to specific problems for multigrade teachers and principals in South Africa. Employing a design research approach to develop a support system for a specific multigrade context therefore can have the benefit of improving support for and guidance to multigrade teachers and principals to:

- locate their collaborative reasoning capacity in a specific place, according to their day-to-day life-setting and needs;
- better understand their specific needs and challenges;
- bring their experience to the learning environment to create meaning;
- have a high degree of influence on what they will learn and how they will learn it;
- participate, after they have received information at a workshop or from an external source, in designing and implementing a learning programme;
- see the applications for the new learning in their classrooms; and
- have a high degree of influence on how learning will be assessed.

Design research also provides the opportunity for process-generating design principles which can be employed by other researchers, District Officials and multigrade teachers and principals wishing to develop or adapt an effective support system in other multigrade contexts in South Africa. This conclusion relates to research sub-question 5, Chapter 7.

8.6 Recommendations

This research succeeded in generating knowledge and advancing our knowledge about the characteristics of an effective support system (PLC) for multigrade teachers and principals, bridging the gap between obtaining knowledge at a workshop and addressing the dilemmas that emerged as they implemented the new practices in the classrooms. This was achieved by identifying design principles and developing design guidelines that addressed a specific

need, allowing the multigrade teachers and principals to work and plan for a period of time on their own without the help of an external source and to implement the five pedagogic activities in their classrooms.

The recommendations for this research are clustered under research limitations (Section 8.6.1) and a support system for bridging the gap in a broader perspective (Section 8.6.2). These are discussed separately.

8.6.1 Research limitations

8.6.1.1 Assessment Phase

This research formed part of a framework (Table 7.1 in Chapter 7) of the CMGE to operationalise the multigrade education methods and to empower the multigrade teachers and principals to apply these methods in their multigrade classrooms – with a PLC as a support system for the multigrade teachers and principals (discussed in Section 7.2.1 in Chapter 7). The evidence showed that a PLC, as a support system, functioned well according to the design principles and guidelines in the context of the multigrade teachers and principals for whom it was adapted, and therefore the design research process for this research ended at the end of the Prototype Phase.

An additional cycle, the assessment phase (Figure 4.4 in Chapter 4), may be required to employ a summative evaluation (where the multigrade teachers and principals are not part of an external intervention and function on their own as a network cluster for collective learning and its implementation), to conclude whether the solution or intervention meets the pre-determined specifications as suggested by Plomp (2009). A try-out (the target group uses the intervention in their day-to-day user setting) may provide data to support up-scaling of the support system to multigrade teachers and principals, working on their own.

8.6.1.2 Including all role players involved with multigrade education in South Africa

The support system studied in this research concentrated only on one group of role players (multigrade teachers and principals) (Table 2.9 in Chapter 2) from multigrade education in South Africa. Research that produces design principles and guidelines on how to roll out the support system in such a way that it functions well on a larger scale, including all the role players (officials and curriculum advisers) in the same support system for multigrade education in South Africa, is required.

This research was conducted in only one geographic region in one province in South Africa. Therefore, further research is also required to ensure that the principles and guidelines of a

PLC, as a support system for multigrade teachers and principals, are transferable to other multigrade contexts in other provinces in South Africa.

8.6.1.3 Supportive and shared leadership

This research supported the design principle of supportive and shared leadership in each of the PLCs involved in the research in order for them to function on their own. During this research, the leader of PLC A took it on himself to also support, guide and assist the leaders of the other PLCs. A study to examine the impact of the same person's taking responsibility for the supportive and shared leadership for more than one multigrade PLC at a time in a support system, may uncover different approaches and identify more guidelines of effective use of the support system for multigrade teachers and principals. This could provide further information for policy makers of multigrade education on how to provide support and guidance, with regard to supportive and shared leadership, to multigrade teachers and principals.

8.6.1.4 Feedback and the assessment processes

In this research, the feedback and assessment processes of the implementation in the classrooms were externally facilitated. A multigrade consultant and adviser (who was also the project manager of the MGRSI of the WCED in 2002) of the CMGE administered the assessments and provided feedback to the multigrade teachers and principals (discussed in Section 7.2.1 in Chapter 7). Using an outsider to assess implementation in the classrooms compromised the process of bridging through which multigrade teachers and principals move as they gradually learn, come to understand, and become skilled and competent in the use of the new ways.

Feedback of the assessment processes plays a vital role in the success of functioning as a PLC. Therefore, an effective PLC support system must offer clear, simple, easy to use and understandable feedback to multigrade teachers and principals of their observable level of use in the actual classrooms. The feedback data should be represented in several ways, be detailed and have diagnostic value, so it may suit the various needs of the multigrade teachers and principals. This provides a bridge between understanding, using the data and implementation in classrooms. If ignored it can influence the performance of the teachers as they progress through the implemented level of use (LoU) of an innovation and become competent using it in the classroom.

From this research it is clear that employing a support system that provides clear, simple, easy to use and understandable feedback to multigrade teachers and principals that can ascertain whether the outputs, with regard to the level of use (observable behaviour), of the

system are what they should be and to ensure that it is self-regulating, is still a challenge for most multigrade teachers and principals. Therefore, it is suggested that the employment of the feedback mechanism and the using of the assessment tools of the feedback mechanism must be part of the training for multigrade teachers and principals on how to function as a PLC support system.

The long-term goal for this support system, by including a feedback component of level of use (discussed in Section 8.2), is that the feedback and assessment processes can be administered by the multigrade teachers and principals in a PLC. This is an important step for a PLC in providing support and guidance to multigrade teachers and principals for collective learning and its implementation in multigrade classrooms. Therefore, a further examination of the use of feedback and assessment processes of LoU in such a system would be beneficial.

8.6.2 Support system for bridging the gap in a broader perspective

In order to keep the design research process manageable and to learn from failures and successes, this research focused on a subset of a more comprehensive picture of the domain of education in South Africa. In this section, this research will be placed in this extended picture, in order to discuss the implementation, exploration of practicality and potential of the support system for bridging the gap between newly acquired teacher competence and the performance of teachers in the classrooms, in other contexts. Although the section only concentrates on a specific component of education, or an explanation of how a specific component of a PLC support system can be used, it is important to realise that a PLC support system is a set of related components that work together in a particular environment to perform whatever functions are required to achieve the system's objectives.

This research focused on an intervention in a specific context, multigrade schools, in South Africa (Table 5.2 in Chapter 5). Multigrade schools are part of the educational system where the quality of education for poor children in South Africa is largely inferior. Therefore, the findings of this research are not just applicable to multigrade education in South Africa, but can also contribute to providing solutions to other problems, identified by the NPC (2011), and provide support models for specific role players.

The in-depth studies and research of the NPC (2011) in South Africa identified teacher performance as one of the main problems contributing to the quality of education and why efforts to raise the quality of education for poor children in South Africa (Table 1.1) have largely failed. Their research identified that the weak teacher performance can be ascribed to teachers that are poorly supported by the administration within education departments, and several efforts to upgrade teachers' skills that have been largely ineffective (Table 1.1 in

Chapter 1). Although the problem manifests itself with the performance of the teachers in schools, the in-depth studies and research of the NPC (2011) identified the origins of the problem within the education system itself, with special reference to the type of teacher training and inadequate support for teachers.

The findings of this research can be used to address the problem of inadequate support for teachers. Currently the responsibility for supporting teachers is situated at the District Offices, and with officials and principals. The MGRSI and the baseline study of the CMGE showed that the provision of support to teachers from these levels is not successful. The support system must be situated at the level of the teachers that must be supported.

8.6.2.1 Bridging the gap – planning of support to teachers

In order to provide adequate support to teachers, it is important that the role players involved in the planning of support to teachers in a education system should realise that implementation or change is not just an event; they should accept the principle that support, implementation or change is a process – a process through which teachers and schools move as they gradually learn, come to understand, and become skilled and competent in the use of the new ways (Hall & Hord, 2011:8). Therefore, for this process to take place, education systems must put an infrastructure in place at every school level to ensure a system to support and guide the teachers. This should be a system that involves all the teachers in a school, grounded in specific design principles and guidelines, and according to the needs of the teachers in their unique context. Role players involved in the planning of support to teachers can use the conceptual framework (Figure 8.2) of this research as an infrastructure to ensure that implementation or change is a process and not a giant leap (Figure 8.3), with no system to support teachers in bridging the gap.

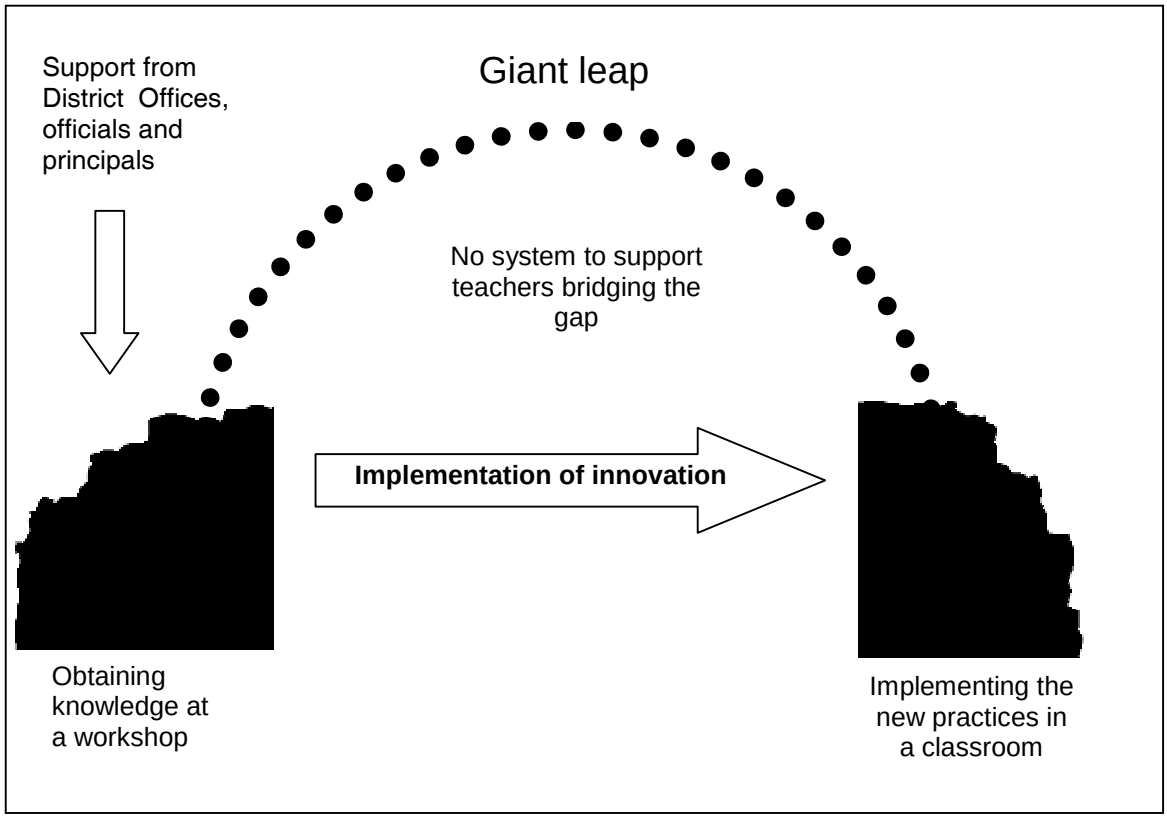


Figure 8.3: Implementation or change is a process and not a giant leap

8.6.2.2 Bridging the gap – teacher performance at each stage of level of use and teachers' observable behaviour

Currently multigrade teachers in South Africa receive most training (input) and support in the form of workshops, visits from officials of the District Offices, Heads of Department and principals. The quality of education (output) is measured by the systemic evaluation for Grades 3, 6 and 9 in the Western Cape, the Annual National Assessment (ANA) tests from the Department of Basic Education (DBE) for Grades 1 – 9, the Grade 12 final exams, and promotion and progression of all the grades at the end of the year. Based on this data, schools must identify their needs and draw up school improvement plans (SIPs) to indicate how they are going to support teachers to improve the quality of education in their schools.

Focusing on systemic evaluation for Grades 3, 6 and 9 in the WCED, the ANA tests from the DBE for Grades 1 – 9, the Grade 12 final exams, and promotion and progression of all the grades at the end of each year, do not support teachers as they move through the process as they gradually learn, come to understand, and become skilled and competent in the use of the new ways. Nor does it provide quality data to determine which teachers need support, why they need support and what type of support they need. This type of evaluation that ignores the formative evaluation and progress of the observable behaviour of the teachers

during the implementation process is failing both the educational system and teachers in delivering quality education.

Support to teachers should therefore be measured during the process through which they move as they gradually learn, come to understand, become skilled and competent in the use of the new ways in classrooms. This support provides a bridge between understanding, using the data and implementation in classrooms and can influence the performance of the teachers as they progress through the implemented LoU of an innovation and become competent in using it in the classrooms. This also ensures that learning becomes job-embedded, for teachers to engage in collective enquiry into both best practices regarding teaching and learning as well as the reality of the current practices and conditions in their schools.

Role players in teacher development can use a PLC support system, as a model of supporting teachers, that provides clear, simple, easy to use and understandable feedback to teachers, principals (leaders) and role players to ascertain whether the level of use are what they should be and to ensure that it is self-regulating.

This model can also be used by the DBE and provincial education departments to obtain more reliable data of the observable behaviour of each teacher (Figure 8.4) and the level of quality of their delivery of the curriculum at each stage of the process. This can help them to obtain a better picture at each stage of the process of what needs to be done (knowledge) to result in action or behaviour (implementation) and to identify problems that impede quality education and support to teachers earlier. Based on this data, the District Offices, officials, Heads of Department and principals can provide additional support, according to the specific needs of the teachers in their unique context.

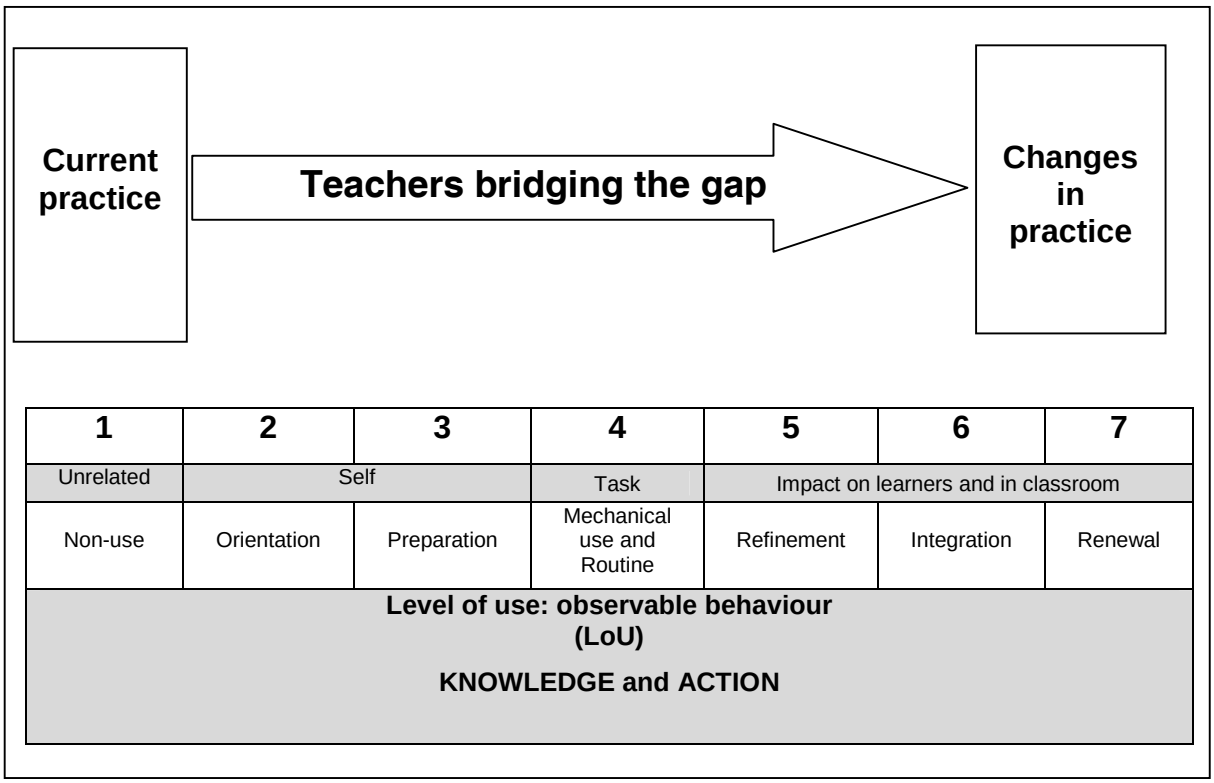
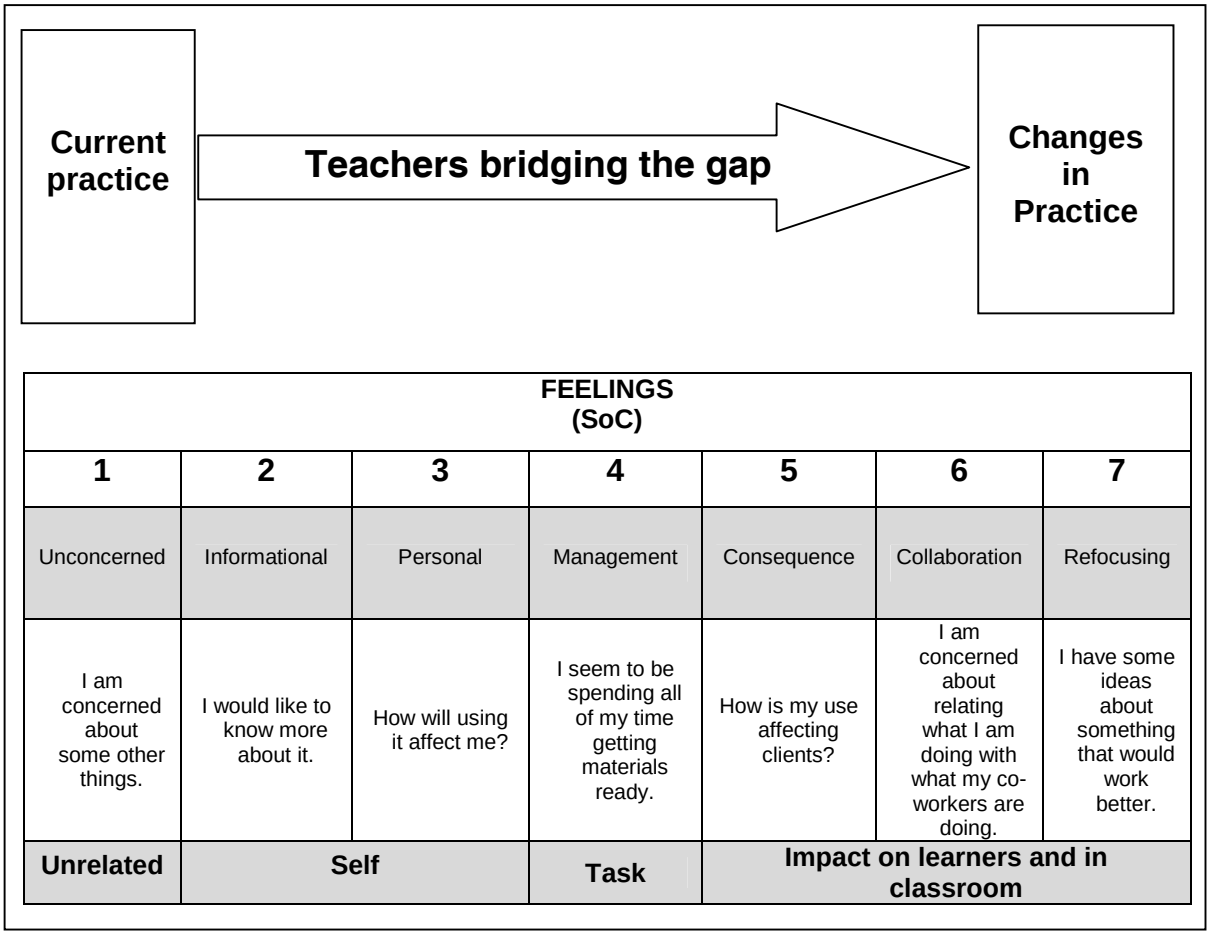


Figure 8.4: Observable behaviour of each teacher (Adapted from Hall *et al.*, 2006:5-7)

8.6.2.3 Bridging the gap – support to teachers at the stage they are at or at the level they are experiencing difficulty

According to Sweeny (2010:3), if teachers' needs are not addressed at the stage they are at or at the level they are experiencing difficulty, they become stuck at some lower level and will use or adopt coping strategies which are often poor practice – this leads to a disconnection between knowledge and action on teacher-learning and use. The impact of not addressing the needs (feelings) of teachers (Figure 8.5) is that once the teachers close their classroom doors, they alter an innovation so that it meets their needs within the complexity of their actual classroom situations and the unique problems they want to address, or else they fall back on what is known and familiar to them. Because of this, the fidelity of the implementation of the innovation is compromised to the point that it is no longer implemented, causing the innovation to fail or leading to weak outcomes.



FEELINGS (SoC)						
1	**2**	**3**	**4**	**5**	**6**	**7**
Unconcerned	Informational	Personal	Management	Consequence	Collaboration	Refocusing
I am concerned about some other things.	I would like to know more about it.	How will using it affect me?	I seem to be spending all of my time getting materials ready.	How is my use affecting clients?	I am concerned about relating what I am doing with what my co-workers are doing.	I have some ideas about something that would work better.
Unrelated	**Self**		**Task**	**Impact on learners and in classroom**		

Figure 8.5: Needs (feelings) of teachers (Adapted from Hall *et al.*, 2006:5-7)

In using the data that only measure the outcomes at the end of each year and ignore the process discussed in Section 8.6.2.2, role players involved in teacher support are uncertain and confused. They do not know what is really causing the weak results, or where and how to support the teachers. Generic solutions, developed by an external source, are then provided to teachers and schools as a possible solution to the problem, creating more uncertainty and confusion – especially when these solutions do not address their specific needs or lead to better results.

Role players involved in teacher support can use a PLC support system as a model that creates an infrastructure and platform for all role-players involved in supporting and addressing those needs appropriately based on information gathered through the components, design principles and guidelines. This can help them to understand what they should do to address and attend to the different stages and levels and where teachers experiencing problems need support. This model can also be used to ensure contextual appropriateness of what works at a specific time during the implementation process and solutions to specific problems, and therefore can have the benefit of improving support and guidance to teachers and principals (leaders) – and not relying only on tests, exams and

promotions at the end of the year to determine, by external sources, what worked and what did not work during the implementation of the curriculum.

8.6.2.4 Bridging the gap – enhancing shared leadership capacity to provide support

The real challenge for educational systems is not just to find solutions to the problems, but also to provide the manpower to provide support for and guidance to the teachers. The fact that the quality of school leadership is seen by the NPC (2011) as one of the main problems in the quality of education in South Africa, does not contribute to solving the problem of finding more manpower to provide support for and guidance to the teachers.

Role players involved in developing leadership and managing leadership in schools, and teachers with the aspiration, knowledge and skills to lead, can use a PLC support system as a model that allows for the traditional role of omnipotent principal to be replaced with a shared leadership model where principals, along with teachers, question, investigate and seek solutions for school improvement. By enhancing shared leadership capacity, it empowers all members of a PLC to share in the vision and mission of the school and make effective decisions that positively affect learning and achievement. The shared leadership component of this model can also support an education system to develop and provide more manpower to provide support and guidance to teachers and relief to officials.

The basis of the concept 'professional learning community' rests with the point of departure that learners' learning is enhanced when there is an improvement in the classroom practice and pedagogy of the teachers – what teachers need to know and the skills teachers need to command in order to make and justify the many different kinds of decisions of which teaching is constituted (Alexander, 2004:11; Vescio *et al.*, 2008: 82). To achieve this, teachers need to work together to attain what they cannot attain on their own, and thus create an environment, which cherishes communal co-operation, emotional support, personal growth and learning.

This research provides the design principles of and guidelines for a PLC support system which allows all teachers to be involved, and to take ownership of the process, as they come to understand what they must do, and become more skilled and competent in the utilisation of new methods in their classrooms.

> "Rather than becoming a reform initiative itself, a professional learning community becomes the support structure for schools to continuously transform themselves through their own internal capacity" Morrissey (2000:10).

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APPENDICES

APPENDIX A:
Professional Learning Community Assessment (PLCA)
(Huffman & Hipp, 2003:70-73)

This questionnaire assesses your perception about your principal, staff, and stakeholders based on the five dimensions of a professional learning community (PLC) and related attributes. There are no right or wrong responses. This questionnaire contains a number of statements about practices that occur in some schools. Read each statement and then use the scale below to select the scale that best reflects your personal degree of agreement with the statement. Shade the appropriate oval provided to the right of each statement. Be certain to select only one response for each statement.

Key terms:
Principal = Principal, not Associate or Assistant Principal
Staff = All adult staff directly associated with curriculum, instruction and assessment of learners
Stakeholders: Parents and community members

Scale:
1 = Strongly disagree (SD)
2 = Disagree (D)
3 = Agree (A)
4 = Strongly agree (SA)

STATEMENTS		SCALE			
	Shared and Supportive Leadership	**SD**	**D**	**A**	**SA**
1	The staff is consistently involved in discussing and making decisions about most school issues.	0	0	0	0
2	The principal incorporates advice from staff to make decisions.	0	0	0	0
3	The staff has accessibility to key information.	0	0	0	0
4	The principal is proactive and addresses areas where support is needed.	0	0	0	0
5	Opportunities are provided for staff to initiate change.	0	0	0	0
6	The principal shares responsibility and rewards for innovative actions.	0	0	0	0
7	The principal participates democratically with staff sharing power and authority.	0	0	0	0
8	Leadership is promoted and nurtured among staff.	0	0	0	0
9	Decision-making takes place through committees and communication across grade and subject areas.	0	0	0	0
10	Stakeholders assume shared responsibility and accountability for learner learning without evidence of imposed power and authority.	0	0	0	0

	Shared Values and Vision	SD	D	A	SA
11	A collaborative process exists for developing a shared sense of values among staff.	0	0	0	0
12	Shared values support norms and behaviour that guide decisions about teaching and learning.	0	0	0	0
13	The staff visions for school improvement that have an undeviating focus on learner learning.	0	0	0	0
14	Decisions are made in alignment with the school's values and vision.	0	0	0	0
15	A collaborative process exists for developing a shared vision among staff.	0	0	0	0
16	School goals focus on learner learning beyond test scores and grades.	0	0	0	0
17	Policies and programmes are aligned to the school's vision.	0	0	0	0
18	Stakeholders are actively involved in creating high expectations that serve to increase student achievement.	0	0	0	0
	Collective Learning and Application	**SD**	**D**	**A**	**SA**
19	The staff work together to seek knowledge, skills, and strategies and apply this new learning to their work.	0	0	0	0
20	Collegial relationships exist among staff that reflect commitment to school improvement efforts.	0	0	0	0
21	The staff plan and work together to search for solutions to address diverse learner needs.	0	0	0	0
22	A variety of opportunities and structures exist for collective learning through open dialogue.	0	0	0	0
23	The staff engage in dialogue that reflects a respect for diverse ideas that lead to continued inquiry.	0	0	0	0
24	Professional development focuses on teaching and learning.	0	0	0	0
25	School staff and stakeholders learn together and apply new knowledge to solve problems.	0	0	0	0
26	School staff is committed to programmes that enhance learning.	0	0	0	0
	Shared Personal Practice	**SD**	**D**	**A**	**SA**
27	Opportunities exist for staff to observe peers and offer encouragement.	0	0	0	0
28	The staff provide feedback to peers related to instructional practices.	0	0	0	0
29	The staff informally share ideas and suggestions for improving learner learning.	0	0	0	0
30	The staff collaboratively review learner work to share and improve instructional practices.	0	0	0	0
31	Opportunities exist for coaching and mentoring.	0	0	0	0

	Supportive Conditions – Relationships	SD	D	A	SA
32	Individuals and teams have the opportunity to apply learning and share results of their practices.	0	0	0	0
33	Caring relationships exist among staff and learners that are built on trust and respect.	0	0	0	0
34	A culture of trust and respect exists for taking risks.	0	0	0	0
35	Outstanding achievement is recognised and celebrated regularly in our school.	0	0	0	0
36	School staff and stakeholders exhibit a sustained and unified effort to embed change into the culture of the school.	0	0	0	0
	Supportive Conditions – Structures	**SD**	**D**	**A**	**SA**
37	Time is provided to facilitate collaborative work.	0	0	0	0
38	The school schedule promotes collective learning and shared practice.	0	0	0	0
39	Fiscal resources are available for professional development.	0	0	0	0
40	Appropriate technology and instructional materials are available to staff.	0	0	0	0
41	Resource people provide expertise and support for continuous learning.	0	0	0	0
42	The school facility is clean, attractive and inviting.	0	0	0	0
43	The proximity of grade level and department personnel allows for ease in collaborating with colleagues.	0	0	0	0
44	Communication systems promote a flow of information among staff.	0	0	0	0
45	Communication systems promote a flow of information across the entire school community including: central office, personnel, parents, and community members.	0	0	0	0

APPENDIX B:
Professional Learning Community Assessment (PLCA) – Frequency Table

Shared and Supportive Leadership						
No	Question		Frequency	Percent	Valid Percent	Cumulative Percent
1	The staff is consistently involved in discussing and making decisions about most school issues.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
2	The principal incorporates advice from staff to make decisions.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
3	The staff has accessibility to key information.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
4	The principal is proactive and addresses areas where support is needed.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
5	Opportunities are provided for staff to initiate change.	Disagree	3	42.9	42.9	42.9
		Agree	4	57.1	57.1	100.0
		Total	7	100.0	100.0	
6	The principal shares responsibility and rewards for innovative actions.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
7	The principal participates democratically with staff sharing power and authority.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
8	Leadership is promoted and nurtured among staff.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
9	Decision-making takes place through committees and communication across grade and subject areas.	Disagree	3	42.9	42.9	42.9
		Agree	4	57.1	57.1	100.0
		Total	7	100.0	100.0	
10	Stakeholders assume shared responsibility and accountability for learner learning without evidence of imposed power and authority.	Disagree	5	71.4	71.4	71.4
		Agree	2	28.6	28.6	100.0
		Total	7	100.0	100.0	
11	A collaborative process exists for developing a shared sense of values among staff.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
12	Shared values support norms and behaviour that guide decisions about teaching and learning.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
13	The staff visions for school improvement that have an undeviating focus on learner learning.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	

Shared Values and Vision						
No	Question		Frequency	Percent	Valid Percent	Cumulative Percent
14	Decisions are made in alignment with the school's values and vision.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
15	A collaborative process exists for developing a shared vision among staff.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
16	School goals focus on learner learning beyond test scores and grades.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
17	Policies and programmes are aligned to the school's vision.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
18	Stakeholders are actively involved in creating high expectations that serve to increase student achievement.	Disagree	3	42.9	42.9	42.9
		Agree	4	57.1	57.1	100.0
		Total	7	100.0	100.0	
19	The staff work together to seek knowledge, skills, and strategies and apply this new learning to their work.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
20	Collegial relationships exist among staff that reflect commitment to school improvement efforts.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
21	The staff plan and work together to search for solutions to address diverse learner needs.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
22	A variety of opportunities and structures exist for collective learning through open dialogue.	Disagree	4	57.1	57.1	57.1
		Agree	3	42.9	42.9	100.0
		Total	7	100.0	100.0	
23	The staff engage in dialogue that reflects a respect for diverse ideas that lead to continued inquiry.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
24	Professional development focuses on teaching and learning.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
25	School staff and stakeholders learn together and apply new knowledge to solve problems.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	

Collective Learning and Application						
No	Question		Frequency	Percent	Valid Percent	Cumulative Percent
26	School staff is committed to programmes that enhance learning.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
27	Opportunities exist for staff to observe peers and offer encouragement.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
28	The staff provide feedback to peers related to instructional practices.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
29	The staff informally share ideas and suggestions for improving learner learning.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
30	The staff collaboratively review learner work to share and improve instructional practices.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
31	Opportunities exist for coaching and mentoring.	Disagree	4	57.1	57.1	57.1
		Agree	3	42.9	42.9	100.0
		Total	7	100.0	100.0	
32	Individuals and teams have the opportunity to apply learning and share results of their practices.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
33	Caring relationships exist among staff and learners that are built on trust and respect.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
34	A culture of trust and respect exists for taking risks.	Disagree	0	0	0	0
		Agree	7	100.0	100.0	100.0
		Total	7	100.0	100.0	
35	Outstanding achievement is recognised and celebrated regularly in our school.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
36	School staff and stakeholders exhibit a sustained and unified effort to embed change into the culture of the school.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
37	Time is provided to facilitate collaborative work.	Disagree	3	42.9	42.9	42.9
		Agree	4	57.1	57.1	100.0
		Total	7	100.0	100.0	

Supportive Conditions - Structures						
No	Question		Frequency	Percent	Valid Percent	Cumulative Percent
38	The school schedule promotes collective learning and shared practice.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
39	Fiscal resources are available for professional development.	Disagree	4	57.1	57.1	57.1
		Agree	3	42.9	42.9	100.0
		Total	7	100.0	100.0	
40	Appropriate technology and instructional materials are available to staff.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
41	Resource people provide expertise and support for continuous learning.	Disagree	4	57.1	57.1	57.1
		Agree	3	42.9	42.9	100.0
		Total	7	100.0	100.0	
42	The school facility is clean, attractive and inviting.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
43	The proximity of grade level and department personnel allows for ease in collaborating with colleagues.	Disagree	2	28.6	28.6	28.6
		Agree	5	71.4	71.4	100.0
		Total	7	100.0	100.0	
44	Communication systems promote a flow of information among staff.	Disagree	1	14.3	14.3	14.3
		Agree	6	85.7	85.7	100.0
		Total	7	100.0	100.0	
45	Communication systems promote a flow of information across the entire school community including: central office, personnel, parents, and community members.	Disagree	3	42.9	42.9	42.9
		Agree	4	57.1	57.1	100.0
		Total	7	100.0	100.0	

APPENDIX C:
Focus group interview with seven principals

QUESTIONS AND ANSWERS

1. Is there something that frustrates you in your multigrade schools?

- The officials of the department have no idea of what you need to do to make things work in the school. You can ask for support, but if you are going to get the support you ask for, is not a sure thing.
- When we must implement new programmes the programmes do not take our reality as multigrade schools into consideration.
- We are stressed and negative about what we should do at the moment and who to ask for help.
- Support should be at levels where we are struggling or need help.
- There is no policy written for multigrade schools in South Africa.
- Many principals do not have a clear role of what is expected of us to support teachers in a multigrade context. This is why we sometimes struggle to support multigrade teachers.

2. What is your definition of support in a multigrade context?

- Support means:
  - to help a new teacher to function in a multigrade classroom and to guide him/her to be successful;
    - to support teachers in obtaining certain skills;
    - to help teachers to plan lessons and to present their work in the classroom;
    - to lead by example so that other teachers can learn from me; and
    - to have regular discussions with teachers about multigrade.
    - It is ironic. All of us sitting here have a need for support, but the best people to give us the support are in fact sitting around this table.
- Officials expect of us to create a planning file (as a support tool) for each learning area, but it is for a monograde classroom. The files are neatly packed out, but I know it is not what it should be to support a multigrade context.
- My biggest challenge is to plan and prepare a lesson for a multigrade context.
- How to be a teacher and a principal at the same time.

3. What is your understanding of a multigrade policy?

- A policy within a multigrade context is a description or explanation of how things should happen. It's like organising the curriculum according to the multigrade schools' needs.

4. Do you have a procedure/system when implementing something new or change in a multigrade classroom? (Shared mission, vision, values and goals)

- No.
- Most of these systems are forced on us from above and we do not have a choice. My problem with these systems is that very few of the systems suit our multigrade schools. Therefore I am not positive about the systems, because it [*sic*] is designed for the whole country and for monograde schools and is forced on multigrade schools.
- The system must be changed to accommodate multigrade schools. Everything is offered only at monograde level. It is also designed by an external source and not for our context.
- When we do get procedures or a system to implement something new or change in a classroom the guidelines are very clear of what needs to be done, but the practicability to implement it in a multigrade school is very difficult.
- To determine whether we are successful with the implementation we must complete a checklist of the District Office.
- Therefore the implementation is a clinical application of an external vision and goals without the multigrade teachers buying into the system.
- We need a system that will fit the multigrade context. It must be simplified and it should make sense and add value to multigrade education. Then we shall be able to buy into the system to implement something new in a classroom.

5. Do you have a procedure/system, when implementing something new or change in a multigrade classroom that supports a culture of collaboration, with a focus on learning, among the teachers?

- No, we do not have a special system.
- We only have one teacher in the specific phase and therefore co-operation is not possible.
- When we have to implement something all of us get together to focus on implementation.

- We do have experience of working in clusters with the previous multigrade intervention. The goal of the clusters was that the teachers get together to collaborate and work together in sharing good practices, but there were major problems. The teachers were selfish and did not want to exchange ideas. The intervention stopped too soon and the clusters were not sufficiently established to continue on their own.
- Guidance was lacking to help or to evaluate whether something would work and there was no evaluation at the end of this cluster meetings.

6. **Do you have a procedure/system, when implementing something new or change in a multigrade classroom that supports an investigation together into best practices and current reality of the teacher in his/her classroom?**

- No.
- We can describe good practices, but we do not have a procedure/system to research together into best practices.
- We only have one teacher in the specific phase and research together into best practices is not possible.

7. **Do you have a procedure/system, when implementing something new or change in a multigrade classroom that supports teachers and principals to change in a classroom by first practising it before implementing in the classroom?**

- No.
- We will talk about it during our break.
- Currently our Grade R teachers receive training at the MGCE and then they go back to test it in the schools and then they will give feedback at the next training session.
- Currently the CMGE is creating the platform where we can obtain knowledge and skills that we can use in our schools.

8. **Do you have a procedure/system, when implementing something new or change in a multigrade classroom that supports a commitment to continuous improvement in the classroom amongst the teachers?**

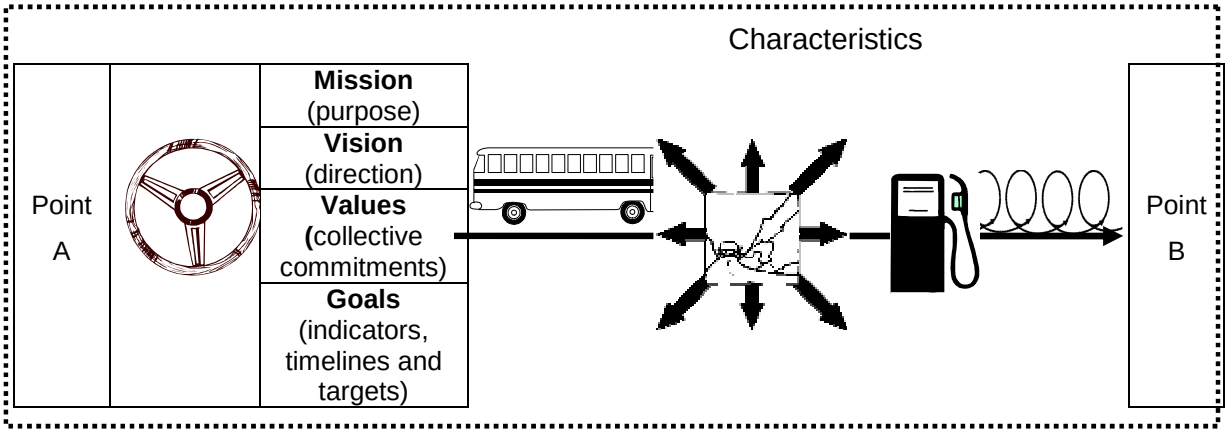
- There is no formal system or a policy.
- As the principal I am responsible to ensure that our school improves.
- I have a system to see how we have done quarterly and where we can still improve, but it is my own system.

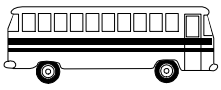
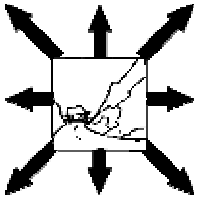
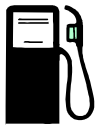
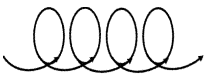
9. Do you have a procedure/system, when implementing something new or change in a multigrade classroom that supports a shared leadership model among your teachers?

- The principal delegates the work.
- Because of the fact that we have so few teachers in a multigrade school we are obliged to rely on a shared leadership model.
- Shared leadership puts greater pressure on us in a multigrade context.
- It is expected from a teacher to accept responsibility and to provide guidance and leadership in a particular learning area or phase because he/she is the only one with the knowledge and experience in that learning area or phase. There is no choice, it is the best we have.
- Working in a cluster we have not experienced shared leadership.

APPENDIX D:
Paper-based prototype of support Prototype 2

Characteristic of a PLC, supporting multigrade teachers and principals to be active participants in the process to move from point A to point B, can be displayed schematically as:



	***1*** *Supportive and shared leadership*	**Mission** (purpose) **Vision** (direction) **Values** (collective commitments) **Goals** (indicators, timelines and targets)	***2*** *Shared mission, vision, values and goals*
	***3*** *Collaborative culture with the focus on learning*		***4*** *Collective inquiry into best practice and current reality*
	***5*** *Action orientation: learning by doing*		***6*** *Commitment to continuous improvement*

Characteristic 1: *Supportive and shared leadership*
Guidelines

Characteristic 1: *Supportive and shared leadership*

- ✓ *Support indicator:* **Enhances shared leadership capacity in order to empower all members of a PLC to share in the vision and mission and to make effective decisions that positively affect learning and achievement.**

a. We support one another when someone experiences difficulties.
b. One of us always takes the lead in the group.

Mission (purpose)
Vision (direction)
Values (collective commitments)
Goals (indicators, timelines and targets)

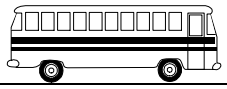
Characteristic 2: *Shared mission, vision, values and goals*
Guidelines

Characteristic 2: *Shared mission, vision, values and goals*

- ✓ *Support indicator:* **Specifies what teachers will start doing today to move their organisation in the intended direction, guided by established clear benchmarks of progress and milestones, on the improvement journey.**

a. **Purpose**: Our group has a definite goal why we get together.
b. **Clear direction**: We know what our group wants to achieve.
c. **Collective commitment**: As a group, we all work together to achieve this goal.
d. **Indicators, Timelines and Targets**:
   - We know **what** we must do.
   - We know **when** to do it.
   - We know **who** must do it.
   - We know **how** we must do it (word-picture descriptions).
   - We know **what proof** we will present to show what we have used or applied in the classrooms.

Characteristic 3: Collaborative culture with the focus on learning
Guidelines

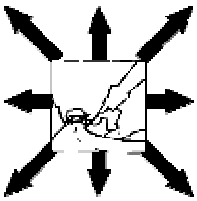


Characteristic 3: *Collaborative culture with the focus on learning*

- ✓ *Support indicator*: **Acts as a strategic vehicle for getting the work accomplished and for moving the organisation into the future.**

a. There is a spirit of co-operation to ascertain how we can improve our present teaching methods in our classrooms.
b. There is a spirit of co-operation to learn together to improve our teaching methods in our classrooms.
c. Discussions take place to ascertain how we can improve our present teaching method in our classrooms.

Characteristic 4: *Collective inquiry into best practice and current reality*
Guidelines

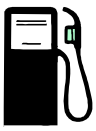


Characteristic 4: *Collective inquiry into best practice and current reality*

- ✓ *Support indicator:* **Engages and supports the members of a PLC in collective inquiry into (1) best practices about teaching, (2) a candid clarification of their current practices, and (3) an honest assessment of the teachers' learning to move beyond discussions and to help them to focus on areas that can contribute to significant improvement.**

Together we carry out research to ascertain what will work best in our classrooms.

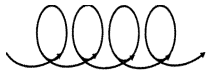
Characteristic 5: *Action orientation: learning by doing*
Guidelines



Characteristic 5: *Action orientation: learning by doing*

- ✓ *Support indicator:* **Provides and serves as the 'fuel' for a PLC to take action in describing the behaviours that are required by an innovation and to define what is to be learned by the implementers in order to use, carry out or perform an innovation.**

a. We learn by having someone demonstrate to us, practically, how it must be done.
b. We learn how to do it by doing and testing it in our classrooms.

Characteristic 6: *Commitment to continuous improvement* **Guidelines** 
Characteristic 6: *Commitment to continuous improvement* ✓ *Support indicator:* **Analyses the impact of the changes and applies the new knowledge in the next cycle to enhance continuous improvement.** We are focused on improving on what we do.

APPENDIX E:
Checklist for Learning Governing Body
(Jordaan & Joubert, 2011a:15)

	Criteria	Implementation				
		Excellent	Good	Average	Weak	Not done
1.	**Learning Governing Body** Explanation of LGB to all learners and parents. Candidates campaign – manifesto. Elections – all students cast votes freely. People from outside (parents, community members, police, etc.). President, vice-president, secretary. Protocol committee – ID kit (name, position) badge. Meet official visitors / welcome – introduction – CM – local products – office – departure.					
2.	**Committees** Decision on 5 / 7 committees. All learners should be part of a committee. Members select a chairperson. Tasks and action plan. Regular meetings and feedback.					
3.	**Community Map** Student takes initiative – LA, class, committee, community / parents inclusive. School, roads and homes of all children in school. Big scale – outside – wall – visible. Direction indicated (north, etc.). All children should be able to indicate their homes.					

APPENDIX F:
Participants involved in the Project 8-intervention

PLC	Multigrade school	Teacher	Gender	Part of group observed in their classroom
A	School 1	Teacher 1	F	Yes
		Teacher 2	F	Yes
	School 2	Teacher 3	F	Yes
		Teacher 4	M	Yes
	School 3	Teacher 5	F	Yes
		Teacher 6	M	Yes
	School 4	Teacher 7	F	Yes
		Teacher 8	F	Yes
	School 5	Teacher 9	F	Yes
		Teacher 10	F	Yes
	School 6	Teacher 11	F	Yes
		Teacher 12	M	Yes
B	School 7	Teacher	F	No
		Teacher	F	No
	School 8	Teacher 13	M	Yes
		Teacher 14	F	Yes
	School 9	Teacher 15	M	Yes
		Teacher 16	F	Yes
	School 10	Teacher 17	F	Yes
		Teacher 18	F	Yes
		Teacher 19	M	Yes
		Teacher 20	F	Yes
	School 11	Teacher 21	F	Yes
	School 12	Teacher 22	F	Yes
		Teacher 23	F	Yes
C	School 13	Teacher 24	F	Yes
		Teacher 25	F	Yes
	School 14	Teacher 26	M	Yes
		Teacher 27	F	Yes
		Teacher 28	M	Yes
		Teacher 29	M	Yes
	School 15	Teacher 30	F	Yes
		Teacher 31	F	Yes
	School 16	Teacher 32	F	Yes
		Teacher 33	F	Yes
		Teacher 34	M	Yes
	School 17	Teacher 35	F	Yes
		Teacher 36	F	Yes
	School 18	Teacher 37	F	Yes
		Teacher 38	F	Yes
		Teacher 39	M	Yes
		Teacher 40	F	Yes
		Teacher 41	M	Yes
	School 19	Teacher 42	F	Yes
		Teacher 43	F	Yes
		Teacher 44	F	Yes
D	School 20	Teacher 45	M	Yes
	School 21	Teacher 46	F	Yes
		Teacher 47	F	Yes
	School 22	Teacher 48	F	Yes
		Teacher 49	F	Yes
		Teacher 50	F	Yes
		Teacher 51	F	Yes
	School 23	Teacher 52	F	Yes
		Teacher 53	F	Yes
		Teacher 54	F	Yes
		Teacher 55	M	Yes
		Teacher 56	M	Yes
		Teacher 57	M	Yes
	School 24	Teacher 58	F	Yes

APPENDIX G:
Structured observation: the visibility and the ratio of the implementation of the five pedagogic activities in the classrooms of the schools

Multigrade teaching methods – pedagogic activities (Jordaan & Joubert, 2011a)	
MM:	Mental Math in a multigrade classroom
LGB:	Learner Governing Body and Community Map in a multigrade school
L:	Lay-out of a multigrade classroom
PT:	Peer Tutoring in a multigrade classroom
DL:	Reading (Do-and-Learn) support

Scale: Implementation in the classroom	
4	Excellent
3	Good
2	Average
1	Weak
0	No implementation in the classroom

Cluster A

Teacher	MM	LGB	L	PT	DL	Total
1	3	2	3	3	3	14
2	2	2	3	3	1	11
3	1	3	2	1	3	10
4	2	3	3	1	3	12
5	3	2	3	2	3	13
6	3	2	3	3	3	14
7	2	2	2	1	2	9
8	3	2	3	2	1	11
9	4	3	3	3	3	16
10	3	3	3	3	3	15
11	3	1	3	2	1	10
12	1	1	1	1	1	5

Teacher	MMRatio	LGBRatio	LRatio	PTRatio	DLRatio	TotalRatio
1	75%	50%	75%	75%	75%	70%
2	50%	50%	75%	75%	25%	55%
3	25%	75%	50%	25%	75%	50%
4	50%	75%	75%	25%	75%	60%
5	75%	50%	75%	50%	75%	65%
6	75%	50%	75%	75%	75%	70%
7	50%	50%	50%	25%	50%	45%
8	75%	50%	75%	50%	25%	55%
9	100%	75%	75%	75%	75%	80%
10	75%	75%	75%	75%	75%	75%
11	75%	25%	75%	50%	25%	50%
12	25%	25%	25%	25%	25%	25%

Cluster B

Teacher	MM	LGB	L	PT	DL	Total
13	3	2	3	0	2	10
14	4	2	3	0	2	11
15	2	2	0	1	1	6
16	2	2	2	1	1	8
17	1	2	2	0	3	8
18	3	2	2	0	3	10
19	3	2	2	0	3	10
20	4	2	4	0	3	13
21	2	2	3	1	1	9
22	3	2	2	1	3	11
23	3	2	3	3	3	14

Teacher	MMRatio	LGBRatio	LRatio	PTRatio	DLRatio	TotalRatio
13	75%	50%	75%	0%	50%	50%
14	100%	50%	75%	0%	50%	55%
15	50%	50%	0%	25%	25%	30%
16	50%	50%	50%	25%	25%	40%
17	25%	50%	50%	0%	75%	40%
18	75%	50%	50%	0%	75%	50%
19	75%	50%	50%	0%	75%	50%
20	100%	50%	100%	0%	75%	65%
21	50%	50%	75%	25%	25%	45%
22	75%	50%	50%	25%	75%	55%
23	75%	50%	75%	75%	75%	70%

Cluster C

Teacher	MM	LGB	L	PT	DL	Total
24	2	3	2	2	2	11
25	3	3	3	2	2	13
26	2	2	2	0	2	8
27	3	2	2	1	2	10
28	1	2	1	0	2	6
29	1	2	2	0	2	7
30	3	2	3	0	2	10
31	3	2	3	1	2	11
32	3	2	2	1	2	10
33	1	2	2	1	2	8
34	1	2	0	1	2	6
35	3	2	3	0	2	10
36	1	2	1	0	0	4
37	3	3	2	2	2	12
38	2	3	2	2	2	11
39	2	3	1	0	2	8
40	3	3	3	3	2	14
41	0	3	1	0	2	5
42	4	2	4	3	3	16
43	3	2	3	2	3	13
44	4	2	2	2	3	13

Teacher	MMRatio	LGBRatio	LRatio	PTRatio	DLRatio	TotalRatio
24	50%	75%	50%	50%	50%	55%
25	75%	75%	75%	50%	50%	65%
26	50%	50%	50%	0%	50%	40%
27	75%	50%	50%	25%	50%	50%
28	25%	50%	25%	0%	50%	30%
29	25%	50%	50%	0%	50%	35%
30	75%	50%	75%	0%	50%	50%
31	75%	50%	75%	25%	50%	55%
32	75%	50%	50%	25%	50%	50%
33	25%	50%	50%	25%	50%	40%
34	25%	50%	0%	25%	50%	30%
35	75%	50%	75%	0%	50%	50%
36	25%	50%	25%	0%	0%	20%
37	75%	75%	50%	50%	50%	60%
38	50%	75%	50%	50%	50%	55%
39	50%	75%	25%	0%	50%	40%
40	75%	75%	75%	75%	50%	70%
41	0%	75%	25%	0%	50%	30%
42	100%	50%	100%	75%	75%	80%
43	75%	50%	75%	50%	75%	65%
44	100%	50%	50%	50%	75%	65%

Cluster D

Teacher	MM	LGB	L	PT	DL	Total
45	2	1	1	1	1	6
46	3	1	2	0	1	7
47	3	1	2	0	2	7
48	3	2	3	0	2	10
49	0	2	1	0	2	5
50	3	1	2	1	2	9
51	4	2	2	1	1	10
52	0	1	2	2	2	7
53	2	1	2	0	2	7
54	3	1	3	0	2	9
55	2	1	2	0	2	7
56	0	1	2	2	2	7
57	1	1	1	0	2	5
58	3	2	2	2	2	11

Teacher	MMRatio	LGBRatio	LRatio	PTRatio	DLRatio	TotalRatio
45	50%	25%	25%	25%	25%	30%
46	75%	25%	50%	0%	25%	35%
47	75%	25%	50%	0%	50%	40%
48	75%	50%	75%	0%	50%	50%
49	0%	50%	25%	0%	50%	25%
50	75%	25%	50%	25%	50%	45%
51	100%	50%	50%	25%	25%	50%
52	0%	25%	50%	50%	50%	35%
53	50%	25%	50%	0%	50%	35%
54	75%	25%	75%	0%	50%	45%
55	50%	25%	50%	0%	50%	35%
56	0%	25%	50%	50%	50%	35%
57	25%	25%	25%	0%	50%	25%
58	75%	50%	50%	50%	50%	55%

Appendix H:
Structured observation: Descriptives of the visibility of the implementation of the five pedagogic activities in the classrooms of the schools

	Cluster	N	Mean	Std Deviation	Std error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower bound	Upper bound		
Mental Math in a multigrade classroom	A	12	2.50	.905	.261	1.93	3.07	1	4
	B	11	2.73	.905	.273	2.12	3.33	1	4
	C	21	2.29	1.102	.240	1.78	2.79	0	4
	D	14	2.07	1.328	.355	1.30	2.84	0	4
	Total	58	2.36	1.087	.143	2.08	2.65	0	4
Learner Governing Body and Community Map in a multigrade school	A	12	2.17	.718	.207	1.71	2.62	1	3
	B	11	2.00	.000	.000	2.00	2.00	2	2
	C	21	2.33	.483	.105	2.11	2.55	2	3
	D	14	1.29	.469	.125	1.02	1.56	1	2
	Total	58	1.98	.635	.083	1.82	2.15	1	3
Lay-out of a multigrade classroom	A	12	2.67	.651	.188	2.25	3.08	1	3
	B	11	2.36	1.027	.310	1.67	3.05	0	4
	C	21	2.10	.944	.206	1.67	2.52	0	4
	D	14	1.93	.616	.165	1.57	2.28	1	3
	Total	58	2.22	.859	.113	2.00	2.45	0	4
Peer Tutoring in a multigrade classroom	A	12	2.08	.900	.260	1.51	2.66	1	3
	B	11	.64	.924	.279	.02	1.26	0	3
	C	21	1.10	1.044	.228	.62	1.57	0	3
	D	14	.64	.842	.225	.16	1.13	0	2
	Total	58	1.10	1.071	.141	.82	1.39	0	3
Reading (Do-and-Learn) support	A	12	2.25	.965	.279	1.64	2.86	1	3
	B	11	2.27	.905	.273	1.67	2.88	1	3
	C	21	2.05	.590	.129	1.78	2.32	0	3
	D	14	1.79	.426	.114	1.54	2.03	1	2
	Total	58	2.07	.722	.095	1.88	2.26	0	3