Exploring the relationship between teacher profiles, professional development and learners' reading literacy achievement

by

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DECLARATION OF ORIGINALITY

I declare that this dissertation, which I hereby submit for the degree **MEd Assessment and Quality Assurance in Education** at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

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Shani Antoinette Zeelie

14 August 2020

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This Ethics Clearance Certificate should be read in conjunction with the Integrated Declaration Form (D08) which specifies details regarding:

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ETHICS STATEMENT

“The author, whose name appears on the title page of this thesis, has obtained, for the research described in this work, the applicable research ethics approval. The author declares that he/she has observed the ethical standards required in terms of the University of Pretoria’s Code of ethics for researchers and the Policy guidelines for responsible research.”

DEDICATION

I dedicate this research to my husband, Regardt Zeelie, and our unborn daughter. May my determination encourage you to follow your dreams in the future.

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ABSTRACT

This study, drawing on the Progress in International Reading Literacy (PIRLS) Literacy 2016 learner achievement data, aimed to examine the relationship between teacher profiles in terms of teachers' age, years of experience and formal qualification, teachers' participation in formal and informal professional development activities and South African Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners. To accommodate all the variables used in the study, a new conceptual framework was developed.

This study was initiated as a result of the PIRLS Literacy 2016 results which revealed that South African Grade 4 learners achieved the lowest reading literacy scores out of the 6 participating countries. This study is a secondary analysis utilising standard multiple regression analysis of the PIRLS Literacy 2016 achievement data and the contextual data from the teacher and school questionnaires.

The study's results revealed that there is no statistically significant relationship between South African teachers' participation in either formal or informal professional development and learners' reading literacy achievement. Based on the literature however, the emphasis was placed on the educational significance of teachers' participation in effective professional development activities.

Keywords: Teacher profiles, teachers' age, teachers' years of experience, teachers' formal qualifications, formal professional development, informal professional development, learner achievement, socio-economic status, economically disadvantaged backgrounds, economically affluent backgrounds.

CERTIFICATE FROM THE LANGUAGE EDITOR

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I hereby declare that I conducted the language editing, formatting and reference checking of the MEd dissertation by Mrs S.A. Zeelie (Student number 13019555).

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LIST OF ACRONYMS

CAPS	Curriculum and Assessment Policy Statements
CPTD	Continuous Professional Teacher Development
DA	Developmental Appraisal
DBE	Department of Basic Education
DME	Data Management Expert
DPC	Data Processing Centre
DSG	Development Support Group
ECD	Early Childhood Development
EFA	Education for All
EMIS	Education Management Information System
ICSA	The Chartered Governance Institute
IRT	Item Response Theory
ISCED	International Standard Classification of Education
IEA	International Association for the Evaluation of Educational Achievement
IQMS	Integrated Quality Management System
LiEP	Language in Education Policy
LoLT	Language of Learning and Teaching
NCS	National Curriculum Statement
NEPA	National Education Policy Act
NRC	National Research Coordinator
NRC	National Research Centre
NQF	National Qualifications Framework
NTT	National Training Team
PCA	Principal Component Analysis
PGP	Personal Growth Plan
PIRLS	Progress in International Reading Literacy Study
PLC	Professional Learning Community

PM	Performance Measurement
PTT	Provincial Training Team
PVs	Plausible Values
RNCS	Revised National Curriculum Statement
SACE	South African Council for Educators
SAQA	South African Qualifications Authority
SASA	South African Schools Act
SGB	School Governing Body
SDGs	Sustainable Development Goals
SDT	Staff Development Team
SIAS	Screening Identification Assessment and Support
SMT	School Management Team
SMT	Senior Management Team
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WSE	Whole School Evaluation
ZPD	Zone of Proximal Development

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

This study aimed to explore the possible relationship between teacher profiles, measured by teachers' age, years of experience and formal qualification, teachers' participation in both formal and informal professional development and learners' reading literacy achievement, when controlling for the socio-economic status of the learners. The study was done by conducting a secondary analysis of the South African Grade 4 learner reading literacy achievement data as revealed by the Progress in International Reading Literacy Study 2016, specifically the Literacy section, which is known as PIRLS Literacy 2016.

Literature suggests that there may be various school-related factors that could be associated with learner achievement (Opper, 2019). Some researchers are of the opinion that, among school-related factors, teachers play the most important role in the achievement of their learners (Opper, 2019; Pearson, 2017; Richland, 2017). When considering teachers' importance in learners' achievement, the need for quality teachers arise. A good quality teacher can be seen as a teacher whose success is reflected in the achievement of their learners (Opper, 2019). Teachers become quality teachers if they are adequately qualified and if they keep up to date with changes and challenges in the education system. Teacher profiles, as well as teachers' participation in formal and informal professional development activities were explored to determine the extent to which learner achievement is dependent on teachers' engagement in these activities to stay updated with the changes and challenges in the education system.

In this study, teacher profiles include teachers' age, years of experience and formal qualifications. Formal professional development activities include seminars, conferences, workshops, short courses and qualifications. Informal professional development activities consist of collaboration between teachers in the form of

discussions, sharing of experiences, observing other teachers, attending cluster meetings, professional learning communities, and sharing of informational material.

The importance of Grade 4 learners' reading literacy abilities is stressed in this study. For the purposes of this study, it is important to note the difference between literacy and reading literacy. Literacy refers to "the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts" (Montoya, 2018, p. 2). Since PIRLS Literacy 2016 focused on reading literacy achievement, reading literacy is defined as:

> *"Reading literacy is the ability to understand and use those written language forms required by society and/or valued by the individual. Readers can construct meaning from texts in a variety of forms. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment"* (Mullis & Martin, 2015, p. 12).

The ability to read is imperative for educational success in all school subjects. Reading skills are also essential for further studies, participation in the economy and meaningful citizenship (Khumalo, 2015).

Learner achievement reflects the quality of the education that learners receive (Khumalo, 2015; Le Cordeur, 2010). PIRLS Literacy 2016 indicated that South African Grade 4 learners struggle to acquire reading literacy skills as their results were the lowest of the six participating countries (Howie et al., 2017a). It is usually a country's education authorities that are responsible for improving low reading literacy outcomes, which then becomes the responsibility of individual teachers (Zimmerman, 2010). The South African education system has undergone multiple changes in the past 25 years. The political landscape has changed, which was followed by various curriculum changes. Furthermore, the different languages and backgrounds of learners pose challenges for teachers in the classroom. Teachers play an important role in adapting to these changes and challenges and implementing improvement programmes to improve South African learners' reading literacy achievement (Howie et al., 2017a).

The Department of Basic Education (DBE) implemented the Integrated Quality Management System (IQMS) and the South African Council for Educators' (SACE)

Continuous Professional Teacher Development (CPTD) system to encourage teachers to participate in formal and informal professional development activities to enhance their teaching and content knowledge and to adapt to the challenges in the education system. Although these opportunities are created for teachers, it seems that many teachers do not participate in the system or do not benefit from the training courses (Singh, 2011).

The changes and challenges faced by teachers raise the question of whether all South African teachers are properly trained to teach in the current education system. It is possible that many South African teachers have not adapted to the changes and challenges in the education system and that their lack of knowledge may be affecting learners' academic achievement.

This study explored the relationship between teacher profiles and learners' reading literacy achievement when controlling for the socio-economic status of the learners. Teacher profiles were measured in terms of the age, years of experience and formal qualifications of teachers, as well as their participation in formal and informal professional development activities. Chapter 1 introduces this study by establishing the context of the study (Section 1.2), followed by the problem statement and rationale for the study (Section 1.3). It then provides the aims and objectives (Section1.4) as well as the research questions (Section 1.5) for the study. Section 1.6 gives a summary of the research methodology, after which the chapter concludes with the outline of the full dissertation (Section 1.7).

1.2 CONTEXT OF THE STUDY

The concept of participative teaching can be used to enhance the context of this study. Participative teaching stresses the importance of the teacher's knowledge about the learning content, various teaching methods and classroom management strategies to generate an environment that is conductive to effective learning (Vakalisa, 2011). Teachers should be able to determine when they should predominantly be in the foreground and when learners should construct their own knowledge (Vakalisa, 2011). Participative teaching emphasises the dynamic relationship between the teacher and the learners, which is supposed to sprout from the teacher's knowledge of educational practices (Vakalisa, 2011).

The transformed curriculum's perspective on learning focuses on the learner and what the learner should be able to do and understand after the curriculum has been transferred (Roux, 2015). The teacher should "train learners to participate actively in their own learning" (Vakalisa, 2011, p. 3). Participative learning is supported by the text-based and communicative approach required in the Curriculum and Assessment Policy Statement (CAPS) (DBE, 2011b). These approaches stress the creation of and communication in authentic situations.

The learner-centred approach can be used to elaborate on participative teaching. Learner-centred teaching places the learner at the core of learning (Smith, 2017). The focus of learning is shifted from the teacher to the learner (Smith, 2017), which allows for more collaboration in the classroom (The SHARE Team, 2018). Learner-centred teaching is intended to address the individual learning needs of every learner (The Glossary of Education Reform, 2014).

Vygotsky's Zone of Proximal Development (ZPD) also contributes to participative teaching and a learner-centred approach. The ZPD is defined as the gap between the current development level of the learner and the learners' potential level of development (Shabani et al., 2010). The ZPD stresses the idea of collaboration between learners and it emphasises scaffolding by the teacher to assist learners in attaining the required knowledge (Shabani et al., 2010).

Many teachers currently in the education system may find it difficult to adapt to teaching in a participative-centred or learner-centred manner as they are used to teaching in teacher-centred classrooms. The PIRLS Literacy 2016 study indicated that most South African learners are taught by teachers older than 40 years of age (Howie et al., 2017a). This suggests that most South African teachers did not learn about participative teaching or the learner-centred approach in their formal education.

As mentioned in the introduction, the South African education system has undergone multiple changes in the past 25 years. To enable learners to achieve their full potential at school level, teachers need to adopt a participative- or learner-centred approach to teaching to accommodate all learners with different backgrounds in the classroom. To realise this, it is important for teachers to engage in both formal and informal professional development activities.

1.3 PROBLEM STATEMENT AND RATIONALE

This study made use of the PIRLS Literacy 2016 study with the aim to investigate the possible relationship between teacher profiles (in terms of teachers' age, years of experience and formal qualifications), teachers' participation in formal and informal professional development activities and Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners.

The PIRLS Literacy 2016 data revealed that South African Grade 4 learners achieved the lowest results of the six participating countries, namely South Africa, Egypt, Morocco, Kuwait, Iran and Demark (Howie et al., 2017a). Furthermore, according to the international PIRLS scale, South African learners obtained the lowest results of the 50 participating education systems (Howie et al., 2017a). These results suggest that South African learners struggle to compete academically with their international peers.

South Africa's achievement results in both PIRLS 2016 and PIRLS Literacy 2016 are a concern as little to no improvement had occurred when compared to the achievement results of 2006 and 2011 (Howie et al., 2017a). Although the DBE has implemented various policies and programmes to improve learners' reading literacy achievement, the efforts have not been successful yet.

Various factors can be associated with Grade 4 learners' low reading literacy achievement. Some of these factors might include teacher profiles, measured by teachers' age, years of experience and formal qualification, and teachers' participation in formal and informal professional development activities. It would appear that the quality of teachers limits the quality of education (Beckmann, 2018).

The South African education system and curriculum have experienced multiple changes over the past 20 years (Howie et al., 2017a; Mestry, 2017; Molapo & Pillay, 2018). Teachers' lack of participation in professional development activities to enhance their content knowledge, curriculum knowledge and teaching practices may possibly be associated with Grade 4 learners' low reading literacy achievement in the PIRLS Literacy 2016 study. As a result, the inadequate training (Molapo & Pillay, 2018)

and content knowledge of teachers (Hodge, 2013; Nkosi, 2012) need to be addressed by the DBE through the IQMS and the CPTD system of SACE.

Continuous professional development is a strategy implemented by the DBE through the IQMS system to address challenges and to provide training in various areas relating to teaching and learning. SACE suggests various forms of professional development activities by means of which teachers can enhance their teaching practices and obtain the required 150 CPTD points in a 3-year cycle (SACE, 2013). SACE's CPTD system suggests that the development activities should lead to better learner achievement (Gulston, 2010), but South African learners' academic performance does not seem to improve. Many formal and informal professional development programmes and activities relating to various aspects of education are available, yet teachers are reluctant to participate in these programmes and activities (Bernadine, 2018). Teachers reported that they were not supported or monitored in their schools when participating in formal and informal professional development activities (Bernadine, 2018; Nel, 2016).

By analysing PIRLS Literacy 2016 data relating to teacher profiles and teachers' engagement in formal and informal professional development activities, the researcher wanted to establish whether or not teachers' reluctance to enhance their knowledge is contributing to South African Grade 4 learners' low reading literacy achievement scores.

Many researchers stress the importance of teachers' participation in formal professional development activities. Therefore, this study can be of significance as it also explored the importance of teachers' engagement in informal professional development activities. It was important to determine which type of professional development activities are vital to learners' reading literacy performance and to emphasise the provision of such activities and teachers' participation in the provided activities. Additionally, the study emphasised the importance of SACE's CPTD system and the importance of teachers' engagement in the various types of activities to enhance their teaching and content knowledge.

1.4 AIMS AND OBJECTIVES

SACE's CPTD system provides teachers with various opportunities to engage in formal and informal professional development activities. Many of these activities correspond with variables in the PIRLS Literacy 2016 teacher questionnaire.

This study used data of the PIRLS Literacy 2016 study to determine a possible relationship between teacher profiles, teachers' participation in formal and informal professional development activities and South African Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners. The teacher profiles included their age, years of experience and formal qualifications.

In order to ascertain this relationship, variables in the PIRLS Literacy 2016 teacher questionnaire were investigated to explore the relationship between:

- teacher profiles and learners' reading literacy achievement;
- teachers' participation in formal and informal professional development and learners' reading literacy achievement.

1.5 RESEARCH QUESTIONS

The main research question was:

> **What is the relationship between Grade 4 learners' reading literacy achievement, teacher profiles and teachers' participation in professional development when controlling for the socio-economic status of the learners?**

This study investigated whether teacher profiles in terms of teachers' age, years of experience and formal qualification, as well as teachers' participation in formal and informal professional development activities could be associated with Grade 4 learners' reading literacy achievement. For this purpose, the study used the PIRLS Literacy 2016 achievement results and selected items from the teacher and school questionnaires. Teachers play an important role in the achievement of their learners (Opper, 2019; Pearson, 2017; Richland, 2017). Thus, teacher profiles as well as teachers' educational knowledge, affected by their participation in formal and informal

professional development activities, could be associated with learner achievement, seeing that teachers are the main mechanisms of information transfer.

This study utilised data of the South African PIRLS Literacy 2016 study to answer the main research question, which was strengthened by the following sub-questions:

1. What is the relationship between teacher profiles and learners' reading literacy achievement?
2. To what extent is learner achievement associated with teachers' participation in formal and informal professional development activities?

1.6 RESEARCH METHODOLOGY

This study explored teacher profiles in terms of their age, years of experience, formal qualification, as well as their formal and informal professional development to ascertain its relationship with South African Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners. The research design used secondary analysis as method to analyse the PIRLS Literacy 2016 data. The analysis employed descriptive statistics, reliability testing and standard multiple regression analysis. Secondary analysis allowed the researcher to explore data collected by another researcher for a different purpose (Johnston, 2014). Existing data were therefore used for further analysis and to contribute new knowledge regarding the PIRLS Literacy 2016 learner achievement results. The research was conducted through a post-positivistic perspective as the analysis of the results required further interpretation.

The aim of this study was to ascertain the effect that teacher profiles and teachers' participation in formal and informal professional development has on learners' reading literacy achievement. This study's main research question explored the relationship between teacher profiles, as well as their engagement in formal and informal development activities, and Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners. The teacher profiles were described in terms of the age, years of experience, and formal qualifications of teachers.

1.7 OUTLINE OF THE STUDY

The dissertation is structured as follows:

Chapter 2 discusses the PIRLS Literacy 2016 study by referring to its origin and background, as well as South Africa's participation in the PIRLS studies. The assessment framework for PIRLS Literacy 2016 is also discussed, which includes the contexts for learning to read, as well as aspects of reading literacy. Additionally, it describes the assessment instruments, data collection and analysis procedures, the methodological norms for PIRLS Literacy 2016 and, finally, the ethical considerations taken into account when conducting the study.

Chapter 3 provides an overview of the literature on reading literacy, teacher profiles and teachers' participation in formal and informal professional development activities. It further elaborates on the challenges faced by the South African education system to which teachers need to adapt. A conceptual framework was specifically constructed for this study as no existing theoretical or conceptual framework includes all the variables considered in this study. This conceptual framework, inspired by Chen and McCray (2012) and Desimone (2009), is outlined in Chapter 3.

Chapter 4 presents the research design and methodology of this study. This includes a discussion on the paradigm by which the data were considered, the research design, sampling, the methods for data collection and analysis, as well as the methodological norms and ethical considerations.

Chapter 5 presents the descriptive statistics of the secondary analysis.

Chapter 6 discusses the findings based on inferential statistics and also includes the reliability analysis, as well as the multiple regression analysis for this study.

Chapter 7 provides a summary of the research, findings, reflections, conclusions and recommendations of the study.

CHAPTER 2
PROGRESS IN INTERNATIONAL READING LITERACY STUDY LITERACY 2016

2.1 INTRODUCTION

The Progress in International Reading Literacy Study (PIRLS) is an international study, conducted by the International Association for the Evaluation of Educational Achievement (IEA), which has recurred every five years since 2001 (Howie et al., 2017a). South Africa has participated in the PIRLS studies since 2006. PIRLS provides countries with the opportunity to compare children's reading abilities with international standards (Howie et al., 2017a; Mullis & Martin, 2015) through standardised reading comprehension tests. PIRLS also aims to provide policy-relevant information that can be used to improve teaching and learning (Howie et al., 2017a; Mullis & Martin, 2015). The PIRLS studies collect achievement data through standardised reading comprehension tests and collect contextual data through the completion of contextual questionnaires.

PIRLS 2016 involved 61 participating education systems, which included 50 countries and 11 benchmarking entities, and was the largest reading literacy study to date (Howie et al., 2017a)[1].

This chapter provides an overview of the methods and procedures used by PIRLS Literacy 2016. It starts by discussing the IEA's role in the PIRLS studies (Section 2.2), followed by an explanation of the difference between PIRLS and PIRLS Literacy and South Africa's participation in both studies (Section 2.3). The PIRLS Literacy 2016 assessment framework, including the context for learning to read, purposes for reading, processes of comprehension and learner characteristics and attitudes, are all explained in Section 2.4. Section 2.5 deals with assessment instruments such as

[1] Education systems refer to the education systems in the different participating countries.

Benchmarking entities refer to sub-national education systems that participate for the purpose of measuring trends. For example, in South Africa, Afrikaans, English and isiZulu speaking Grade 5 learners participated as benchmarking participants.

assessment booklets and contextual questionnaires. The PIRLS Literacy 2016 research design is discussed in Section 2.6, followed by the research methods, which include the sampling methods used for the study (Section 2.7). Section 2.8 discusses the translation and adaption of the PIRLS Literacy 2016 material. In Section 2.9 the PIRLS Literacy 2016 data collection methods are described, followed by the methods of analysis in Section 2.9. An explanation of the methodological norms is then provided (Section 2.10), after which the ethics for the PIRLS Literacy 2016 South African study is discussed (Section 2.11). Finally, the conclusion to Chapter 2 is presented in Section 2.12.

2.2 THE INTERNATIONAL ASSOCIATION FOR EDUCATIONAL ACHIEVEMENT (IEA) AND PIRLS

The IEA is an international, self-governing cooperative consisting of various research institutions, agencies and scholars, whose aim is to improve education worldwide (IEA, 2019a). Members of the IEA range from universities to ministries of education (Howie et al., 2017a). More than 60 countries and 100 education systems participate in IEA studies (IEA, 2019c). The IEA was initiated in 1958 when a group of educational psychologists, scholars, psychometricians, and sociologists came together to discuss problems relating to school effectiveness and student learning (IEA, 2019b). The IEA became a legal entity in 1967. The IEA has a permanent secretariat based in the Netherlands; its Data Processing Centre is located in Germany, while the International Study Centre is located at Boston College in the USA (Roux, 2015).

The IEA currently plays an important role in various large-scale assessments in education (IEA, 2019a). The IEA has measured achievement in subjects such as mathematics, science and reading (IEA, 2019c). It has also directed assessments of computer and information literacy, civic and citizenship education, and early childhood and teacher education (IEA, 2019c). The IEA aims to help its members “understand effective practices in education and develop evidence-based policies to improve education” (IEA, 2019a, para. 2). The cross-national perspective offered by the IEA allows the measuring of trends in learner achievement (Roux, 2015).

PIRLS is a comparative study performed by the IEA that assesses the reading literacy achievement of Grade 4 or Grade 5 learners in most countries (Mullis & Martin, 2015).

Through the PIRLS studies, the IEA provides information regarding the participating system's reading literacy achievement (Mullis & Martin, 2015). It also offers suggestions for improvement of reading literacy achievement to researchers and teachers (Mullis & Martin, 2015).

South Africa's participation in PIRLS Literacy 2016 was managed by the Centre for Evaluation and Assessment (CEA) at the University of Pretoria. The CEA was established in 2002 at the University of Pretoria by the founding director, Professor Sarah Howie, and was initially the vision of the former Dean, Professor Jonathan Jansen (Howie et al., 2017a). The CEA is the National Research Centre (NRC) for all the PIRLS studies in South Africa, as well as for various other research projects.

2.3 SOUTH AFRICA'S PARTICIPATION IN BOTH PIRLS AND PIRLS LITERACY

Although the current study utilised the PIRLS Literacy 2016 data, it is important to understand the difference between PIRLS and PIRLS Literacy. PIRLS assesses the reading literacy achievement of learners in their fourth year of schooling as it marks an important transition point in a child's reading development (Mullis & Martin, 2015).

PIRLS Literacy originated from PIRLS. Evidence of poor learner performance in PIRLS 2006 required the opportunity to test reading literacy at an easier level. PIRLS Literacy was first introduced in 2011 as prePIRLS and developed into PIRLS Literacy in 2016 (Mullis & Martin, 2015). The design of PIRLS and PIRLS Literacy is similar; however, PIRLS Literacy measures foundational reading comprehension processes (Hooper et al., 2015). PIRLS Literacy uses shorter texts, simpler grammar, easier vocabulary and places less emphasis on higher order thinking skills (Van Staden et al., 2016). It emphasises "the ability to focus on and retrieve explicitly stated information" (Hooper et al., 2015, p. 14).

PIRLS Literacy allows countries whose Grade 4 learners are still developing crucial reading skills to have their results reported on the PIRLS achievement scale (Mullis & Martin, 2015).

Countries can participate in either PIRLS or PIRLS Literacy, or both, depending on the country's level of educational development (Mullis & Martin, 2015). Table 2.1 summarises South Africa's participation in PIRLS and PIRLS Literacy since 2006.

Table 2.1: South Africa's Participation in PIRLS and PIRLS Literacy

Cycle	Study Type	Languages Tested	Grades Tested
2006	PIRLS	All 11 official languages	Grade 4 Grade 5
2011	PIRLS prePIRLS	Afrikaans and English All 11 official languages	Grade 5 Grade 4
2016	PIRLS PIRLS Literacy	Afrikaans, English and isiZulu All 11 official languages	Grade 5 Grade 4

Note. Sourced from Howie et al. (2008) and Howie et al. (2017a)

South African Grade 4 learners participated in prePIRLS 2011 and PIRLS Literacy 2016 because poor reading literacy performance was evident in the results of PIRLS 2006. Participation in PIRLS Literacy continues to be an indication of learner performance and offers South Africa an opportunity to gain information about learner performance that could assist in developing strategies to improve learners' reading literacy achievement.

To measure the trends in achievement over the past 10 years, South African Grade 5 learners participated in PIRLS, as explained above[2]. The Grade 5 PIRLS results could be used as a benchmark to measure and compare South African learners'

[2] A smaller sample size, including only Afrikaans, English and isiZulu speaking learners, were used as benchmarking participants.

performance over the past 10 years and to determine whether learners' achievements have improved or not.

The current study utilised PIRLS Literacy 2016 data and therefore the following discussion focuses on the methods and procedures of PIRLS Literacy 2016.

2.4 PIRLS LITERACY 2016 RESEARCH DESIGN

The focus of the PIRLS studies is on learners' reading literacy achievement, which is viewed as pivotal to function in a modern society (Howie et al., 2017a). Reading literacy is vital, not only for learning but also for personal growth, recreation and communication (Roux, 2015). Reading literacy enables learners to participate in and contribute to society (Mullis & Martin, 2015). PIRLS Literacy follows a survey design as data are gathered through achievement booklets and background questionnaires[3]. PIRLS Literacy is designed as a trend study that measures learners' reading literacy achievement in countries around the world (LaRoche et al., 2017). Countries need to participate in multiple cycles of PIRLS in order to measure trends (Howie et al., 2017a). It further illuminates possible factors that may be related to learners' development (Roux, 2015). PIRLS also attempts to place a minimal burden on schools, teachers and learners (LaRoche et al., 2017), as the assessment booklets are administered by fieldworkers, and teachers are not required to process any of the data.

2.5 PIRLS LITERACY 2016 ASSESSMENT FRAMEWORK

The PIRLS Assessment Framework provides the foundation for the assessment of learners' reading achievement in PIRLS and PIRLS Literacy (Mullis & Martin et al., 2015). It serves as an outline for the IEA's assessment of reading literacy achievement (Roux, 2015).

2.5.1 READING LITERACY

Reading literacy is at the centre of the PIRLS studies. The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines literacy as "the ability to identify, understand, interpret, create, communicate and compute, using printed and

[3] Achievement booklets and background questionnaires are discussed in Sections 2.6.2 and 2.6.3.

written materials associated with varying contexts" (Montoya, 2018, para. 1). Since the PIRLS Literacy 2016 study focuses on reading literacy achievement, a definition of reading literacy is given below:

> *"Reading literacy is the ability to understand and use those written language forms required by society and/or valued by the individual. Readers can construct meaning from texts in a variety of forms. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment"* (Mullis & Martin, 2015, p. 12).

The IEA has elaborated on this definition of reading literacy since 1991 and many theories of reading literacy have been used to construct the definition (Mullis & Martin, 2015). The definition of reading literacy used by PIRLS takes into account readers of all ages, various language forms and learners' reading experience and it emphasises the importance of reading in school and in everyday life (Mullis & Martin, 2015). The PIRLS definition stresses the importance of actively constructing knowledge while reading and the ability to use a range of reading strategies to construct meaning from texts (Mullis & Martin, 2015).

However, reading literacy also implies being able to read numerous types of texts including books, newspapers, magazines, documents, text messages, traditional media and television media (Khumalo, 2015).

The importance of reading literacy emphasises the need to provide learners with ample opportunities to read a variety of available texts. Reading opportunities should be provided at school in classrooms and school libraries, as well as in the community and at home.

2.5.2 CONTEXTS FOR LEARNING TO READ

Learners in primary grades acquire reading literacy skills through encounters with a variety of literacy activities within a range of social contexts (Roux, 2015). The contextual questionnaires provide a better understanding of "effective educational strategies for development and improvement" (Mullis & Martin, 2015, p. 3). The home environment and access to resources at home support the learning process (Mullis & Martin, 2015); it is, however, evident that many South African households are not well

resourced in terms of education (Howie et al., 2017a). Effective learning climates can be created when four contexts support each other (Mullis & Martin, 2015). The four contexts (see Figure 2.1) are national and community contexts, school context, classroom context, and home context (Mullis & Martin, 2015).

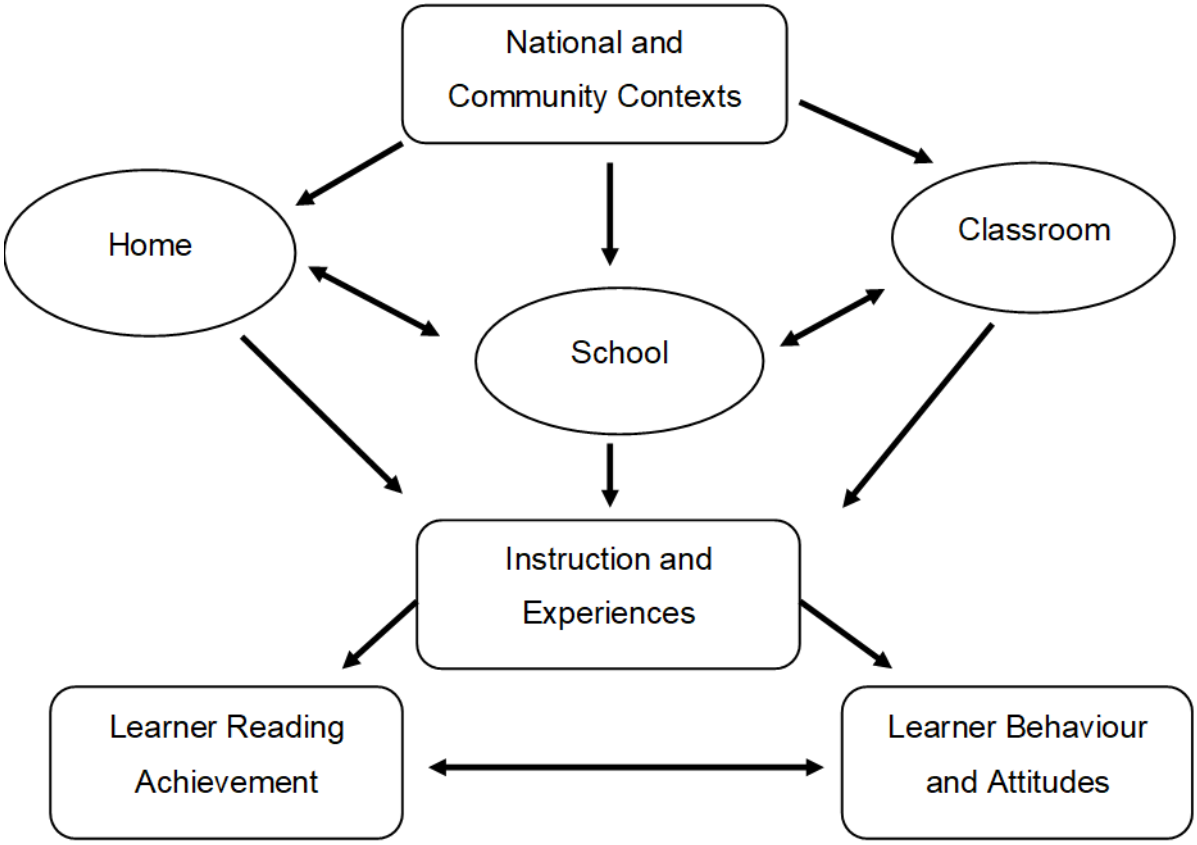

Figure 2.1: Contexts for the Development of Reading Literacy

Note. Adapted from Mullis et al., 2006 as cited in Howie et al., 2017a, p. 30.

Figure 2.1 shows the relationship between home, school and classroom contexts. It also indicates that these contexts are affected by national and community contexts. The interaction between the contexts has an impact on learners' instruction and experiences and also on their reading achievement, attitudes and behaviours (Hooper et al., 2015). Experiences within the different contexts determine learner outcomes. It is likely that poor learner outcomes may be a result of poor conditions in any one of the four contexts (Hooper et al., 2015). The following sections explain the four contexts for reading literacy development.

2.5.2.1 National and Community Contexts

A learner's reading literacy development can be affected by a country's cultural, social, political and economic conditions (Hooper et al., 2015). Literacy is a right and it is included in international and national policies, legislation and declarations (UNESCO, 2005b). Literate people provide benefits for a country on cultural, social, political and economic levels (UNESCO, 2005b).

Countries need to focus on education and citizens' literacy (Roux, 2015). This focus on literacy requires certain educational policies to be implemented and monitored (Roux, 2015). The required resources should also be in place for educational development to take place (Howie et al., 2017a). Hooper et al. (2015) stress that the following aspects should be focused on to provide effective reading instruction: an emphasis on language(s) and literacy; organisation and structure of the educational system; economic resources, population demographics and geographical characteristics; learner flow; teachers and teacher education; the reading curriculum and the monitoring of curriculum implementation.

The diverse South African context poses challenges for providing effective reading instruction (Khumalo, 2015). The societal structure in South Africa comprises urban, suburban and rural areas (Howie et al., 2017a). Education for All (EFA) and the Sustainable Development Goals (SDGs) form part of South Africa's development plan. The United Nations explains that SDGs aim to "achieve a better and more sustainable future for all" (United Nations, n.d. a, para. 1). It is supported by most countries. SDGs target inequality, poverty, climate, prosperity, environmental degradation, peace and justice (United Nations, n.d. a).

Quality education for all is also listed as an SDG (United Nations, n.d.). It is not only a goal, but education also plays an important role in the achievement of SDGs (United Nations, n.d. b). The South African Constitution, Act 108 of 1996, specifies that basic education, including adult basic education, is a fundamental human right and should be of good quality. The DBE envisions further educational goals for the South African context. The *Action Plan to 2014: Towards the Realisation of Schooling 2025* identifies 27 goals, of which the following five are emphasised:

- *"To improve access to Early Childhood Development (ECD) below Grade 1;*
- *To improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their careers;*
- *To ensure that every learner has access to the minimum set of textbooks and workbooks required according to policy;*
- *To ensure that all the basic annual management processes take place across all schools in the country in a way that contributes towards a functional school environment; and*
- *To improve the frequency and quality of the monitoring and support services provided to schools by district offices, partly through better use of e-Education"* (DBE, 2011a, p. 8-9).

Education is in a learning crisis and many countries are failing to provide learning for all (World Bank, 2017a). "Reading literacy is at the heart of the learning crisis" (Howie et al., 2017a, p. 23). Assessments, such as the PIRLS studies, aim to improve the teaching and learning of reading in primary education (Roux, 2015). Knowledge of the cultural, social, political and economic factors that are associated with education will assist countries in the improvement of their learners' reading literacy achievement.

2.5.2.2 Home Contexts

The PIRLS studies found that there is "a positive relationship between early literacy activities in the home and learner achievement at the fourth grade" (Hooper et al., 2015, p. 39). Learners' exposure to reading and some form of text is very important even before learners start with formal schooling (DBE, 2019a). Hay and Fielding-Barnsley (2007) clarify that factors such as engagement in pre-school literacy activities, parental involvement, home language, attitudes and beliefs towards reading, and the availability of books at home are related to learners' reading literacy achievement. In other words, parents, caregivers, siblings, family members and the community also influence learners' views of reading through their own beliefs about reading (Alam, 2015).

Although books are important, computers, literacy toys and activities can also be viewed as mechanisms that can be used to acquire reading literacy skills (Roux,

2015). Access to literacy mechanisms promotes reading literacy achievement (Hooper et al., 2015).

The language spoken at home plays an important role in learner achievement because it is related to learners' fluency in the language of reading instruction (Hooper et al., 2015). A learning gap may exist when the curriculum is transferred in a language with which learners are not familiar (Hooper et al., 2015). The complexity of this issue is illustrated in South Africa as learners are taught in their home language in the Foundation Phase of schooling. However, most South African learners must start learning in English or Afrikaans from Grade 4. This language transition poses challenges for many South African learners (Howie et al., 2017a). Another obstacle for many South African learners is the availability of educational resources in African languages (Howie et al., 2017a).

Parental involvement plays a crucial role in learners' reading literacy achievement (Khumalo, 2015; Roux, 2015). The socio-economic status of parents tends to be related to learner achievement (Hooper et al., 2015). Furthermore, the attitudes and beliefs of parents towards reading, as well as their educational expectations of their children, influence learners' motivation to read and succeed in school (Hooper et al., 2015). Reading aloud to children is the most common and important literacy activity (Hooper et al., 2015). Parents who read to their children can encourage them to start reading books independently (Hooper et al., 2015).

Parents can also be involved in their children's schooling by becoming a member of a school governing body (SGB), as stipulated in Section 20 (1) (e) of the South African Schools Act, 84 of 1996. It is important for schools to communicate effectively with parents and to get them involved in learners' learning.

2.5.2.3 School Contexts

The school context refers to the place where formal education and learning takes place (Hooper et al., 2015). The ability of a school to reach its curricular goals may be related to the environment and organisation of the school (Hooper et al., 2015). The authors suggest that the following factors might be indicators of the effectiveness of a school: the location of the school, instructional resource shortages, learners' socio-economic

background, teachers' working conditions and job satisfaction, principal leadership, a safe and orderly environment and the school's emphasis on academic success.

Poor conditions in schools may be related to poor learner achievement in the PIRLS studies. Schools in urban areas may have access to more resources than those in rural areas (Hooper et al., 2015). Quality school resources are important for quality instruction (Hooper et al., 2015). Learners' skills development is dependent on the availability of resources (Roux, 2015). General and subject-specific resources are required for effective curriculum implementation (Hooper et al., 2015). To acquire the necessary resources, adequate funding needs to be available.

Although emphasis is placed on the importance of the availability of resources for reading instruction, funding for these resources are not always available for all South African schools, especially in remote rural areas. "South Africa was classified by the United Nations Development Programme as being a Medium country on the Human Development Index[4] and ranked 118 out of 188 countries in 2016" (Howie et al., 2017a, p. 7). Access to primary education in South African has improved to such an extent that almost all learners have access to primary education (Howie et al., 2017a). Compared to other countries, South Africa spends a large portion of its budget on education (Howie et al., 2017a). More than 70% of the learners in South Africa attend public schools. Of these schools, 87% are non-fee-paying schools, which improve access to education for all learners. Most of the learners who participated in the PIRLS Literacy 2016 South African study came from remote rural areas (Howie et al., 2017a).

Yet, the quality of the received education is debatable as many schools in South Africa suffer serious shortcomings (Howie et al., 2017a). Only a few schools have well-equipped libraries and many communities do not have libraries at all (Howie et al., 2017a). It is a concern that not only rural schools, but also suburban and urban schools have a shortage of resources like instructional materials, qualified teachers, libraries, books and buildings (Roux, 2015).

[4] Human Development Index – Very high, High, Medium and Low

The poor learner achievement in the PIRLS studies could be an indication of a lack of resources in South African schools, which hampers teaching and learning activities (Howie et al., 2017a). It also suggests that the extensive funding provided for education may not be allocated and used properly.

The PIRLS Literacy 2016 results indicated higher achievement for schools whose teachers experienced good working conditions and had access to facilities, resources and materials (Hooper et al., 2015). The results also showed that a positive school environment contributes to greater teacher satisfaction and evidently learners' learning also improves (Hooper et al., 2015).

The guidance of the principal also plays an important role in learner achievement as the principal brings coherence by aligning the culture and structure of the school with its central purpose (Hooper et al., 2015). There is also an association between academic achievement and a school's emphasis on success (Hooper et al., 2015). Safe, orderly and disciplined environments lead to higher learner achievement (Hooper et al., 2017). It is important for learners to feel comfortable to study and participate in school activities, including reading activities, to develop the necessary reading skills (Roux, 2015).

2.5.2.4 Classroom Contexts

It is also possible that the classroom environment can be associated with successful learning since most of the teaching and learning activities in a school take place in the classroom (Hooper, et al., 2015). Teacher preparedness and experience, instructional time, classroom resources, instructional engagement, classroom assessment and instruction for online reading may be related to learner achievement (Hooper et al., 2015).

Daily classroom activities and social interaction may have an impact on the reading development of learners (Hurst et al., 2013). The teacher is the most important human resource in the classroom and can affect learners' reading development positively or negatively through the opportunities provided (Khumalo, 2015).

"The preparation and preparedness of teachers is critical" (Hooper, et al., 2017, p. 45). Teachers' qualifications indicate the extent of the training that they have received, and

it affects the quality of their instruction (Khumalo, 2015)[5]. Teachers need to have extensive knowledge in the subjects that they teach. In language instruction, emphasis has to be placed on pedagogy in teaching reading (Hooper et al., 2015). Teacher experience and participation in professional development activities also play an important role in the classroom context and teachers who continue to participate in teacher development activities can have a positive effect on learner achievement (Hooper et al., 2015)[6].

It is important to have reading resources in the classroom (Hooper et al., 2015). Learners who have access to reading resources are more likely to read (Hooper et al., 2015). Learners should have a variety of reading resources, including books, magazines, posters, digital reading resources, etc. (Hooper et al., 2015). Given that these resources are available to learners, opportunities should be created for formal and independent reading (Hooper et al., 2015).

The amount of time specified and set aside for reading influences the opportunities to learn to read (Hooper et al., 2015). It is vital that instructional time should be used effectively towards achieving the reading goals (Hooper et al., 2015). Additionally, time spent on instructional engagement may also predict reading achievement. Engagement takes place when a learner "listens to the teacher, discusses texts with peers, or reads independently" (Hooper et al., 2015, p. 47). The teacher should use effective methods of instruction to ensure learners' engagement throughout the lesson (Hooper et al., 2015). Teachers can ensure engagement through effective classroom management strategies and motivating learners by creating a positive classroom environment (Hooper et al., 2015). The South African data of PIRLS Literacy 2016 indicated that there is no relationship between instructional time and reading achievement, which could indicate a possible lack of effective teaching and learning (Howie et al., 2017a). The number of learners in a class may also be related to

[5] Chapter 3 provides more in-depth information on factors relating to teacher profiles, including teacher qualifications.

[6] Chapter 3 elaborates on teachers' participation in formal and informal professional development activities.

instructional time as it can have an impact on instruction and the teacher's ability to provide individual assistance to learners (Roux, 2015).

Considering the technological advancements in the world, instruction for online reading may also be beneficial for the improvement of learners' reading skills. Online reading can encourage additional skills like locating information on a search engine or synthesising information from different websites (Hooper et al., 2015).

Classroom assessment should effectively monitor learner progress and achievement and also provide feedback. The frequency and format of assessments are important because frequent testing could lead to improved learner achievement (Hooper et al., 2015). Both formal and informal assessments allow the teacher to make important decisions about the learners' learning (Hooper et al., 2015).

The current study paid special attention to the classroom context since the focus of the study was on teacher profiles and teachers' participation in formal and informal professional development activities[7].

2.5.2.5 Learner Characteristics and Attitudes Towards Learning

Learner motivation and confidence may be associated with learner achievement (Hooper et al., 2015). Reading literacy does not only refer to the ability to construct meaning from different texts, but also to attitudes and behaviours that cultivate lifelong readers (Roux, 2015). Positive attitudes towards reading can develop a learner's full potential within the literate world (Roux, 2015). Learners who can read portray a more positive attitude toward learning than those who can't (Roux, 2015). Furthermore, learners with a positive attitude towards reading may engage more willingly in reading activities (Roux, 2015). PIRLS and PIRLS Literacy 2016 include information relating to learner motivation, learner readiness to learn, learner reading literacy behaviours, and learner self-concept. These aspects are summarised in Table 2.2.

[7] See Chapter 3 for an elaborate discussion on teacher profiles and formal and informal professional development activities.

Table 2.2: Aspects Relating to Learner Characteristics and Attitudes Towards Learning

ASPECT	DESCRIPTION
Learner Readiness to Learn	Learners should be psychologically ready to engage with learning content. Nutritional problems and sleep deprivation may be a barrier for learning and lead to lower achievement. This is linked to the socio-economic status of the learner. Furthermore, learners should also have prior knowledge of the subject matter as new learning is linked to what learners already know.
Learner Motivation	Learners' motivation is important for success in reading. Motivation can be classified into two constructs: extrinsic motivation and intrinsic motivation. Intrinsic motivation is related to having a positive attitude towards reading since a learner may find it interesting and enjoyable. Extrinsic motivation comes from external rewards like money, praise and career success. Although intrinsic motivation is more related to reading achievement, extrinsic motivation may be necessary as most learners do not have intrinsic motivation to read.
Learner Self-Concept	Learners' beliefs about their abilities in a subject influence their achievement. If learners feel that a task is beyond their ability, it may affect their motivation. In contrast, confident learners may complete tasks more easily.
Learner Reading Literacy Behaviours	Learners who have a strong reading self-concept usually read more than their peers and have better reading comprehension. Recreational reading habits lead to improved reading abilities since it is linked to vocabulary improvement and spelling abilities. Reading should be encouraged and supported at home as it influences reading throughout a child's schooling.

Note. Summarised from Hooper et al. (2015).

2.5.2.6 Contextual Questionnaires

A wide range of information about home and school contexts that may affect learners' reading literacy achievement was collected through contextual questionnaires, which inform learner outcomes (Hooper et al., 2015). All learners who participated in PIRLS/PIRLS Literacy 2016, as well as their parents, teachers and principals, completed these questionnaires to provide the necessary data (Hooper et al., 2015). The contextual questionnaires are important as they cover a wide range of policy-relevant information (Hooper et al., 2015). The data collected through the questionnaires can provide insight into strategies for development and improvement (Hooper et al., 2015).

2.5.3 ASPECTS OF PIRLS LITERACY 2016

The PIRLS 2016 framework, based on the reading purposes and processes of comprehension, provides the foundation for the PIRLS 2016 assessment of learners' reading achievement (Hooper et al., 2015). The purposes for reading and the processes of comprehension are integrated into the context in which learners live and learn (Hooper et al., 2015).

2.5.3.1 Purposes for Reading

People read for various reasons, including "personal interest, pleasure, community participation and reading to learn" (Khumalo, 2015, p. 34). The PIRLS 2016 framework identified two main purposes for reading: for literary experience and to acquire and use information (Hooper et al., 2015). Both purposes for reading are equally important and contain an equal number of questions assessing each purpose (Hooper et al., 2015). The reading comprehension processes used for both purposes are similar. The purposes for reading are achieved when the learner can construct meaning from the text (Hooper et al., 2015).

Reading for Literary Experience

Reading for literary experience is related to reading for pleasure and personal interest. When reading a literary text, learners bring their "own experiences, feelings, appreciation of language, and knowledge of literary form" (Hooper et al., 2015, p. 15). Learners may also encounter unknown feelings and situations. PIRLS 2016 and

PIRLS Literacy 2016 assessments mainly used narrative fiction because different cultures, languages and curricula in the different countries need to be taken into consideration (Hooper et al., 2015). The literary passages, based on fiction, "have questions addressing theme, plot events, characters, and setting" (Hooper et al., 2015, p. 15).

Reading to Acquire and Use Information

Reading to acquire and use information is related to reading to learn and helps learners to understand facts about the world and the way things work (Roux, 2015). Informational texts may include informative articles and instructional texts (Hooper et al., 2015). Readers must view informational text with a critical mind to form their own opinion since some texts may be straightforward presentations of facts and others may be argumentative (Hooper et al., 2015). Text organisation varies. Younger learners may be exposed to historical facts that are presented in a chronological manner, sequenced instructions or logical arguments (Hooper et al., 2015). The informational texts used in the PIRLS 2016 assessments were representative of informational materials that learners from the different countries read (Hooper et al., 2015). Questions about the information in the informational passages are based on the information contained in the passages (Hooper et al., 2015).

2.5.3.2 Processes of Comprehension

"Readers construct meaning in different ways" (Hooper et al., 2015, p. 18). The act of constructing meaning from a text allows readers to evaluate their understanding of the text and adjust their approach to reading, if necessary (Roux, 2015). Four comprehension processes used by Grade 4 learners are measured by the PIRLS studies: "focus on and retrieve explicitly stated information; make straightforward inferences; interpret and integrate ideas and information; and evaluate and critique content and textual elements" (Hooper et al., 2015, p. 18). The metacognitive strategies that learners use to interpret texts, as well as their knowledge and background experiences, assist learners in making sense of the material (Hooper et al., 2015). The variety of questions used in the PIRLS Literacy 2016 assessment enabled learners to demonstrate their ability to use various skills in constructing meaning from written texts (Hooper et al., 2015). The difficulty of the questions will be

determined by the nature of the text. The processes discussed below are categorised from a concrete level to mastery of more advanced reading skills (Mullis et al., 2015) and are summarised as follows:

- Focus on and retrieve explicitly stated information;
- Make straightforward inferences;
- Interpret and integrate ideas and information; and
- Evaluate and critique content and textual elements.

Focus on and Retrieve Explicitly Stated Information

Different readers focus on different explicitly stated information in a text. To answer a question in a reading task or to check their understanding, readers need to retrieve explicitly stated information in a text (Hooper et al., 2015). To locate relevant content, the reader needs "to focus on the text at word, phrase and sentence level in order to construct meaning" (Hooper et al., 2015, p. 18). Pieces of information may also have to be retrieved from different locations. Retrieving explicitly stated information requires little to no inferring or interpreting skills; however, the relevance of the information needs to be recognised (Hooper et al., 2015). Examples of reading questions regarding retrieval of explicitly stated information could include: "identifying information that is relevant to the specific goal of reading; searching for definitions of words or phrases; looking for specific ideas; identifying the setting of the story; and finding the topic sentence or main idea" (Hooper et al., 2015, p. 18).

Make Straightforward Inferences

A reader can make straightforward inferences from a text when it is based on information contained in the text. This allows the reader to resolve gaps in the meaning of texts (Hooper et al., 2015). In some instances, the reader will only have to connect two or more ideas in the text. The ideas may be clearly stated, but the connection needs to be inferred. The more skilled the reader is, the easier it becomes to make the connections (Hooper et al., 2015). Making straightforward inferences requires readers to focus on more than just word-level, phrase-level or sentence-level meaning. The reader should also be able to connect local and global meaning in the text (Hooper et al., 2015). Examples of reading tasks relating to straightforward inferences could

include: “inferring that one event caused another event; identifying generalisations made in a text; concluding what is the main point made by a series of arguments; and describing the relationship between two characters” (Hooper et al., 2015, p. 19).

Interpret and Integrate Ideas and Information

Similar to making straightforward interpretations of a text, interpreting and integrating ideas and information allow for the focus on national and international meanings, as well as details relating to overall ideas and themes (Hooper et al., 2015). Interpretation and integration assist the reader in making sense of the entire text (Hooper et al., 2015). Readers attempt to construct a more specific and thorough understanding of the text by including experience and personal knowledge with meaning within the text (Hooper et al., 2015). Learners’ background knowledge and experiences help them to make connections based on their own perspective. For this reason, learners’ interpretations may vary, depending on their experience with and background knowledge of the reading task (Hooper et al., 2015). Reading tasks that are good examples of this type of text processing include the following: “discerning the overall message or theme of a text; considering an alternative to actions of characters; inferring a story’s mood or tone; interpreting a real-world application of text information; and comparing and contrasting text information” (Hooper et al., 2015, p. 21).

Evaluate and Critique Content and Textual Elements

Hooper et al. (2015) explain that evaluation and critique of content require a shift from creating meaning to critically considering the text itself. The text content can be critiqued and evaluated from a personal point of view or from an objective perspective. This may require readers to make a justified decision, based on their interpretations and a comparison between their understanding of the text and their understanding of the world. Readers will have to reject, accept or remain neutral to the text’s representation (Hooper et al., 2015). To evaluate and critique elements of a text, readers use their knowledge of “language usage, presentational features, and general or genre-specific features of a text” (Hooper et al., 2015, p. 21). Readers may evaluate and critique the author’s language, use of visual and textual features, and the organisation of the text (Hooper et al., 2015). Examples of reading tasks that require evaluation and critique include the following:

- *"Judging the completeness or clarity of information in the text;*
- *Evaluating the likelihood that the events described could really happen;*
- *Evaluating how likely an author's argument would be to change what people think and do;*
- *Judging how well the title of the text reflects the main theme;*
- *Describing the effect of language features, such as metaphors or tone; and*
- *Determining an author's perspective on the central topic"* (Hooper et al., 2015, p. 22).

2.6 PIRLS LITERACY 2016 ASSESSMENT INSTRUMENTS

PIRLS Literacy 2016 was designed as a survey and measures trends in learner reading literacy in a five-year cycle (Martin et al., 2015). The PIRLS reading achievement scale allows countries to compare their Grade 4 learners' reading progress over time. The PIRLS Literacy 2016 study used two types of instruments: background questionnaires and achievement booklets. Section 2.6.1 explains the question types and scoring procedures, followed by a discussion of the achievement booklets (Section 2.6.2) and the background questionnaires (Section 2.6.3).

2.6.1 QUESTION TYPES AND SCORING PROCEDURES

Learners' comprehension was tested through the comprehension questions that accompanied each text. Two question formats were used in the PIRLS Literacy 2016 assessment: multiple-choice and constructed-response questions (Martin et al., 2015). Multiple-choice questions are worth one mark, whereas constructed-response questions can be worth up to three marks, depending on the difficulty of the question (Martin et al., 2015).

Four response options are provided for multiple-choice questions, of which only one can be correct. Multiple-choice questions can assess any of the comprehension processes but may be less suitable for interpretations or evaluations since provision is not made for learner explanations (Martin et al., 2015). Questions are provided in a clear manner and options are written concisely to minimise the reading demand of the question (Martin et al., 2015). Clear instructions at the beginning of the assessment assist learners who are unfamiliar with the format in answering these questions.

A written response is provided for constructed-response questions. These types of questions can assess any of the comprehension processes and are well-suited for questions that require learners to provide support for their answers (Martin et al., 2015). Constructed-response questions may be worth up to three points, depending on the amount of the support required (Martin et al., 2015). Questions should be asked in such a manner that it is clear to learners what is expected of them in the required response. Scoring guides describe the awarding of points for partial, complete or extensive understanding of the text (Martin et al., 2015). The focus in scoring constructed-response questions is on learners' understanding and not their ability to write well. Scoring also considers the possibility of different appropriate interpretations of the text (Martin et al., 2015).

2.6.2 ACHIEVEMENT BOOKLETS

The PIRLS Literacy 2016 assessment design used a "matrix sampling technique: each reading passage and its accompanying items is assigned to a block, and the blocks are then systematically distributed among individual learner booklets" (Martinet al., 2015, p. 58). This technique is used to lighten the burden on individual learners. "PIRLS Literacy consist of 12 passages/blocks, each of which is expected to require 40 minutes of learner testing time" (Martin et al., 2015, p. 58). Table 2.3 shows the division of the blocks in PIRLS Literacy 2016.

Table 2.3: PIRLS Literacy 2016 Matrix Sampling Blocks

Purpose for Reading	**Block**					
Literary experience	PLLit1	PLLit2	PLLit3	PLLit4	PLLit5	PRLit1
Acquire and use information	PLInf1	PLInf2	PLInf3	PLInf4	PLInf5	PRInf1

Note. Adapted from Martin et al. (2015, p. 59)

Table 2.3 shows five blocks for literary experience, namely PLLit1–PLLit5. It also shows the five informational blocks, PLInf1–PLInf5. Four of the passages were previously used as part of prePIRLS in 2011, which allowed for the measuring of trends in 2016. The remaining six blocks were newly developed for 2016 (Martin et al., 2015).

The PIRLS Literacy 2016 booklet design consisted of Booklets 1–15 and a PIRLS Literacy Reader[8]. Each booklet consisted of two 40-minute blocks of passages and items, one literary passage and one informational passage (Martin et al., 2015). The PIRLS Literacy design included ten PIRLS Literacy passages (PLLit1–PLLit5 and PLInf1–PLInf5) and items shown in Table 2.3 and two of the PIRLS passages. The PIRLS Literacy Reader contained literary blocks PLLit5 and informational block PLInf5. Table 2.4 shows the learner booklet design for PIRLS Literacy 2016.

Table 2.4: PIRLS Literacy 2016 Learner Booklet Design

Booklet	Part 1	Part 2
1	PLInf1	PRLit1
2	PLLit2	PLInf1
3	PLInf3	PLLit2
4	PLInf3	PLLit4
5	PLLit4	PRInf1
6	PLLit1	PRInf1
7	PLInf2	PLLit1
8	PLLit3	PLInf2
9	PLLit3	PLInf4
10	PLInf4	PRLit1
11	PLLit2	PRInf1
12	PLInf3	PLLit1

[8] The PIRLS Literacy Reader is not linked to any other blocks directly; however, it is assigned more frequently to learners during the randomised sampling process. The PIRLS Literacy Reader's questions are presented in a separate booklet so that the Reader itself can be left at the school.

Booklet	Part 1	Part 2
13	PLInf2	PRLit1
14	PLLit3	PLInf1
15	PLInf4	PLLit4
Reader	PLLit5	PLInf5

Note. Adapted from Martin et al. (2015, p. 62)

Each of the five informational blocks and five literary blocks can be found in three of the fifteen PIRLS Literacy booklets, each time paired with a different block (Martin et al., 2015). The inclusion of PIRLS items in the PIRLS Literacy assessments and including PIRLS Literacy items in the PIRLS assessments allow for a link between PIRLS and PIRLS Literacy to be maintained. It also ensures that learners who take part in the PIRLS Literacy assessments may also have their results reported on the PIRLS scale (Martin et al., 2015).

After the data have been collected, learner responses "for both the PIRLS and PIRLS Literacy are placed on the PIRLS reading achievement scale using item response theory methods that provide an overall picture of the assessment results of a country" (Martin et al., 2015, p. 56)[9]. Plausible values[10] methodology was used to acquire reading literacy scores for all participating learners (Foy et al., 2015).

2.6.3 BACKGROUND QUESTIONNAIRES

The PIRLS Literacy 2016 study also took into account home, community, school and learner factors that may be related to learners' reading literacy achievement. Data about these factors are collected through questionnaires completed by learners, their parents, teachers and principals (Martin et al., 2015). A National Research Coordinator

[9] Data analysis methods are discussed in Section 2.9.

[10] Plausible values use all available data, including learner responses and contextual information to estimate the characteristics of the learner population.

(NRC) then provides information relating to the national and community contexts for learning through the curriculum questionnaire and their country's entry into the *PIRLS 2016 Encyclopedia* (Martin et al., 2015). The questionnaires are summarised in Table 2.5.

Table 2.5: Contextual Questionnaires Used in PIRLS Literacy 2016

Questionnaire	Description
Learning to Read Survey (Home Questionnaire)	Parents or primary caregivers of learners complete the *Learning to Read Survey*. This questionnaire provides information on the home context of the learner. Items on the questionnaire are related to languages spoken at home, parents' attitudes towards reading and reading activities, and parents' occupations and education. The questionnaire further collects information about learners' educational experiences out of school and the child's readiness at the beginning of primary school. The questionnaire takes about 10–15 minutes to complete (Martin et al., 2015).
Teacher Questionnaire	This questionnaire is completed by the learners' reading teachers. It gathers information about the classroom contexts in terms of reading instruction, reading instructional approaches and instructional time. The questionnaire also asks questions about teacher characteristics, including education, career satisfaction, and recent professional development activities. It takes more or less 35 minutes to finish the questionnaire (Martin et al., 2015).
School Questionnaire	The principal of each school completes the school questionnaire, which is about school characteristics such as the availability of technology and resources, the school environment and learner demographics. It also asks questions about the principal's

Questionnaire	Description
	education, leadership role and experience. The questionnaire takes 30 minutes to fill in (Martin et al., 2015)[11].
Learner Questionnaire	The learner questionnaire is referred to as the *student questionnaire* in the PIRLS 2016 framework. Learners complete this questionnaire after completing the reading assessment. It collects information about the learners' home environments, including books in the home, languages spoken and other home resources for learning. Learner experiences at school, like their feeling of belonging and bullying, are also addressed in this questionnaire. It also addresses learners' reading habits and attitudes towards reading. This questionnaire takes 15–30 minutes to complete (Martin et al., 2015).
Curriculum Questionnaire	The curriculum questionnaire adds to the *PIRLS 2016 Encyclopedia* by collecting information about the different countries in terms of time specified for reading instruction, goals and standards for reading instruction, and national policies on reading curricula. It also collects information about pre-primary education and teacher education policies (Martin et al., 2015).

The collected contextual information also assists in providing suggestions on how educational systems can be improved to foster reading achievement (Hooper et al., 2015). Participating countries were also allowed to include *National Options* in the contextual questionnaires. *National Options* are additional questions that are added to the questionnaires. For example, in South Africa the questions provided more insight into the South African educational landscape and context (Howie et al., 2017a).

[11] The current study will only utilise variables from the teacher and school questionnaires.

2.7 PIRLS LITERACY 2016 RESEARCH METHODS

This section discusses the research methods used for PIRLS Literacy 2016. Emphasis is placed on the complex nature of the sampling design for the PIRLS Literacy 2016 South African study.

2.7.1 PIRLS 2016 SAMPLING

PIRLS Literacy 2016 assessed the reading achievement of learners in their fourth year of formal schooling as it is an important transition point in a child's development (Mullis & Martin, 2015). At this stage learners have learned how to read and are now reading to learn (Martin et al., 2015). The target population for PIRLS Literacy 2016 is defined as follows: "The PIRLS target grade should be the grade that represents four years of schooling, counting from the first year of ISCED Level 1" (Martin et al., 2015, p. 55).

However, some countries also participate as benchmarking participants with other test populations, which are then not representative of the entire country (Howie et al., 2017a). "PIRLS employs a two-stage random sample design, with a sample of schools drawn as a first stage and one or more intact classes of learners selected from each of the sampled schools as a second stage" (LaRoche et al., 2017). Classes were sampled as PIRLS Literacy 2016 paid attention to learners' curricular and instructional experiences, usually organised on a classroom basis (LaRoche, et al., 2017). Sampling classes also leads to less disruption of the school's everyday activities (LaRoche et al., 2017).

Each participating country's NRC and PIRLS sampling experts assist in developing and implementing the national sampling plan (LaRoche et al., 2017). Statistics Canada advises the NRC to ensure that the national sampling plan adheres to the PIRLS standards (LaRoche et al., 2017). After the sampling has been completed and the data have been collected, "Statistics Canada documents population coverage and school and learner participation rates and constructs appropriate sampling weights for use in analysing and reporting the results" (LaRoche et al., 2017, p. 3.2).

2.7.2 PIRLS LITERACY 2016 SOUTH AFRICAN SAMPLING DESIGN

South Africa participated in PIRLS Literacy 2016 at Grade 4 level. The sample was fully representative, meaning that the sample was representative of the eleven official

languages and the nine provinces (Howie et al., 2017a). South Africa also participated as benchmarking participant at Grade 5 level and the sample chosen at this level represented Afrikaans, English and isiZulu schools, representative of provinces (Howie et al., 2017a). The benchmarking participants allow for analysing the success of the transition between Grade 4 and 5 and to examine progression in learners' reading achievement (Roux, 2015). "Overall, the study aimed to assess how well learners at the Grade 4 level comprehend a text when compared to the international benchmarks and standards" (Howie et al., 2017a, p. 30).

This section specifically elaborates on the South African sample for PIRLS Literacy 2016. South African Grade 4 learners were selected as population for the study. Selection was based on the language of learning and teaching (LoLT) in Grade 1 to Grade 3 (Foundation Phase). More learners may be chosen from specific areas where the language is mostly spoken, and the schools are located (Howie et al., 2017a). A random sample of schools is then selected, which is representative of language and province (Howie et al., 2017a).

Statistics Canada sampled 304 schools from the sampling frame to participate in PIRLS Literacy 2016, based on the Education Management Information System (EMIS) dataset (Howie et al., 2017a). "The EMIS data was combined with data about language implementation in the Foundation Phase in schools obtained from the Department of Basic Education" (Howie et al., 2017a, p. 32). A two-stage stratified cluster sampling design was utilised to select the sample for PIRLS Literacy 2016. Schools were first sampled in proportion to size in stage one, followed by randomly sampled classrooms in the second stage (Howie et al., 2107a). All learners in the selected classes participated in the study. The sample was representative of both province and the language that was used as LoLT in Grade 1–3, but not together (Howie et al., 2017a). Learners who participated in PIRLS Literacy 2016 had to be exposed to the language for four years. Sampling was also done in such a way that it was possible to conduct both PIRLS and PIRLS Literacy at the same schools (82 common schools) (Howie et al., 2017a).

Schools voluntarily participated in the PIRLS Literacy 2016 study and could be replaced by one of two replacement schools if a school refused to participate (Howie

et al., 2017a). Table 2.6 depicts South African schools' participation in PIRLS Literacy 2016.

Table 2.6: Participating Schools in PIRLS Literacy 2016

	Intended Sample	Attained Sample
Schools	304	293
Classrooms	436	324

Note. Data obtained from Howie et al. (2017a)

The schools that did not participate had either closed down, were unreachable or had compromised the data collection by misreporting the home languages presented in the Foundation Phase (Howie et al., 2017a). A total of 12 810 Grade 4 learners participated in the PIRLS Literacy 2016 South African study (Howie et al., 2017a).

2.8 TRANSLATION AND ADAPTION OF INSTRUMENTS

All PIRLS assessment instruments were originally developed in English, which required countries to translate the instruments to the LoLT used in the country. NRCs were responsible for the preparation and translation of the assessment instruments (achievement booklets and contextual questionnaires) for their countries (Johansone, 2015). The translation and adaption of instruments were very important to the success of PIRLS 2016 and PIRLS Literacy 2016 and the instruments had to undergo several rounds of translation, which were verified by the IEA in Amsterdam (Ebbs & Wry, 2017).

In South Africa, a certified translation company was used to translate the instruments to 10 of the official languages and the international US version to UK English (Howie et al., 2017a). Grade 4 language teachers were also recruited to assist in the translation process to review passages for the appropriateness of translation and difficulty for Grade 4 (Howie et al., 2017a). The translation company made the final decisions about the translations. The late release of the instruments complicated the translation process. All new PIRLS Literacy 2016 passages had to be translated, and back translated, and translations had to be verified and proofread against English

versions in the restricted period (Howie et al., 2017a). A total of six PIRLS Literacy passages underwent translation and extensive verification. The trend passages could not be drastically changed as it could lead to invalid links between the studies across different cycles (Howie et al., 2017a). The translation team attempted to translate the instruments as fairly as possible; however, the qualitative differences in languages were acknowledged (Howie et al., 2017a).

In terms of the contextual questionnaires, the School and Teacher Questionnaires were translated only into Afrikaans, while the Learner and Parent Questionnaires were translated into the other 10 official languages (Howie et al., 2017a). The adaptions made to all the instruments had to conform to the international format for comparability purposes (Johansone, 2015). To ensure that the questionnaires conformed to the international format, extensive quality assurance processes were undertaken (Howie et al., 2017a). International translation verification ensured that translated instruments were quality assured by the IEA. During this process, international partners selected local South African translators to check the quality of the instruments and suggest improvements that were then implemented by the language specialists, together with the translators (Howie et al., 2017a).

2.9 DATA COLLECTION

The PIRLS Literacy 2016 study was an international large-scale study that required the process of data collection to be strictly monitored for quality assurance to ensure that valid comparisons could be made for learner reading achievement (Johansone, 2015). The data collection of the PIRLS Literacy 2016 South African study is discussed in Section 2.9.1, followed by a discussion in Section 2.9.2 of the scoring and data capturing procedures.

2.9.1 DATA COLLECTION

The printing, preparation, and distribution of the assessment materials to the participating schools required thorough planning from the NRC (Johansone, 2015). The data for the study were collected at the end of 2015 and the beginning of 2016 (Howie et al., 2017a).

Quality assurance was ensured during every step of the process. Packaging assistants were assigned and trained to ensure that all the instruments were properly packed into the correct boxes. This process was further overseen by CEA quality control officers who checked each box with a quality assurance checklist before despatching it to the fieldwork company (Howie et al., 2017a).

Learners answered the questions to the passages on their own, having 40 minutes to complete each passage. Thereafter, the *Learner Questionnaire* was administered by the fieldworker who read each question and demonstrated how to answer it (Howie et al., 2017a).

2.9.2 SCORING AND CAPTURING

The reliability of the scoring process was of cardinal importance as the scoring is directly related to the quality of the results (Johansone, 2015). The NRCs of the participating countries attended international training sessions to score the constructed response items according to specific scoring guides (Johansone, 2015). The NRCs then trained their scoring staff and provided them with guidelines and example papers (Johansone, 2015).

In South Africa, batches for each language were created in preparation for the scoring. The scoring processes, adapted from Howie et al. (2017a, p. 40), are summarised below:

1. Scorers were recruited based on language of assessment, educational training and experience.
2. Scorers were interviewed and assigned to teams that checked randomly selected achievement booklets on separate sheets, which were first captured for the reliability of the scoring to be compared.
3. Three researchers with expertise in Afrikaans, English and some of the African languages, received international training on the scoring guides. They then provided workshops and training, specific to passages, to the other scorers. They also moderated booklets and provided feedback.
4. Team leaders for each representative language were selected and they became responsible for the quality assurance of the scripts for their teams.

5. Cross-country reliability scoring ensured quality assurance as the English scorers scored items from other English-speaking countries to compare the reliability of the international scoring level to their own scoring levels.
6. Trend reliability scoring allowed for the comparison between trend passages of PIRLS 2016 and PIRLS 2011.

Data Management Expert (DME) software, provided by the IEA, was used to capture the data. Templates for the capturing of all instruments were created by the CEA with assistance from the IEA. An external company, whose team was trained by the CEA data manager, was used to capture all the data (Howie et al., 2017a). The data manager played an important role in the data cleaning process. South African data were double captured and resulted in 100% verification of all instruments[12] (Howie et al., 2017a). All the data files and documentation were finally submitted to the IEA in Hamburg for further processing (Johansone, 2015).

2.10 DATA ANALYSIS

The Data Processing Center (DPC) in Hamburg provided the final data processing, software and support for analysis to all countries (Howie et al., 2017a). The TIMSS and PIRLS International Study Center examined the achievement items of participating countries to detect errors in the assessments so that it could be remedied to ensure good quality (Foy et al., 2017).

PIRLS Literacy 2016 used plausible values (PVs) to produce the achievement scores, as presented in the report (Howie et al., 2017a). Item response theory (IRT) was used to scale the overall achievement results of PIRLS Literacy 2016. IRT allows for the combination of learner answers to provide plausible values of reading achievement and to estimate reading proficiency scores for all learners (Martin et al., 2017). Plausible values[13] are further used to determine learner proficiency scores as it uses

[12] The results were 100% verified as it was captured by two people and then compared to reduce errors (Howie et al., 2017).

[13] Plausible values do not refer to learner achievement scores, but are estimated values based on the combination of all available background data (Martin et al., 2017).

all the available background data to estimate the characteristics of learner populations (Howie et al., 2017a)[14].

Achievement results were reported on the PIRLS achievement scale with a centre point of 500 and standard deviation of 100. As mentioned in Chapter 1, the achievement results of South African Grade 4 learners were lower than those of learners in other countries. The results of all participating countries were examined to be scaled into the four benchmarks set by the IEA for expected learner performance. The PIRLS 2016 International Benchmarks explain what learners know and can do at certain points along the PIRLS achievement scale (Mullis & Prendergast, 2017). The four benchmarks include:

- "Advanced International Benchmark (625);
- High International Benchmark (550);
- Intermediate International Benchmark (475); and
- Low Intermediate Benchmark (400)" (Mullis & Prendergast, 2017).

The PIRLS achievement scale allows for both PIRLS and PIRLS Literacy results to be scaled since PIRLS and PIRLS Literacy had two passages in common. Passages and items that were only found in the PIRLS Literacy assessment could, however, only be considered for the low and intermediate benchmarks (Mullis & Prendergast, 2017).

The international PIRLS 2016 results are reported in *PIRLS 2016 International Results in Reading*, which includes the PIRLS Literacy 2016 results. The South African results were publicly released on 5 December 2017 and the PIRLS Literacy 2016 South African results were reported in the *PIRLS Literacy 2016 Summary Report: South African Children's Reading Literacy Achievement*.

International Database (IDB) Analyzer software was created specifically for IEA data to take into account the complex procedures and the sample weights used in the different IEA studies (Howie et al., 2017a). The International Study Centre and

[14] See Chapter 11 in Martin et al. (2017) for an elaborate discussion on IRT and plausible values.

participating countries use the IDB Analyzer software to analyse data for country reports (Howie et al., 2017a).

2.11 METHODOLOGICAL NORMS

PIRLS was designed to provide valid and reliable information about learner achievement in countries around the world (LaRoche et al., 2017). Since PIRLS is a five-year trend study which began in 2001, the validity and reliability of PIRLS Literacy 2016 has already been established. Quality assurance in the PIRLS studies is crucial to ensure that valid comparisons of learner achievement across countries can be made (Roux, 2015). Johansone and Wry (2017) stress that considerable efforts were made to ensure that the PIRLS 2016 data, including the PIRLS Literacy 2016 data, met the highest standards.

Validity refers to the extent to which inferences can be drawn from assessment results (Gareis & Grant, 2015). Content and construct validity relate directly to the PIRLS Literacy 2016 study. Content validity is related to how well an assessment samples the intended learning outcome (Gareis & Grant, 2015). The PIRLS Literacy 2016 study assured content validity as the assessment booklets, as well as the contextual questionnaires, were verified and quality assured, both nationally and internationally (Howie et al., 2017a). Construct validity is concerned with the theoretical framework of what is being measured or the extent to which the assessment measures what it is supposed to measure (Gareis & Grant, 2015). The assessment booklets in the PIRLS Literacy 2016 study, which were specifically developed to focus on reading literacy skills, adhere to construct validity as PIRLS Literacy 2016 intended to measure Grade 4 learners' reading literacy achievement.

In addition to validity, reliability is linked to the consistency of the results of an assessment (Gareis & Grant, 2015). PIRLS Literacy 2016, being a part of a trend study, contributes to the reliability of the assessment as data collection, analysis and interpretation were quality ensured. Foy et al. (2017) explain that quality control in the reviewing of items was very important. The Cronbach's Alpha coefficient of reliability was calculated at the assessment booklet level and specific reliability criteria in terms of the scoring had to be met. Measures were taken to ensure that the constructed-

response items, carried over from 2011, had been scored in the same reliable manner (Foy et al., 2017).

2.12 RESEARCH ETHICS FOR PIRLS LITERACY 2016 SOUTH AFRICA

Because the Department of Education regards reading literacy as a priority, the Minister of Basic Education, Angie Motshekga, gave her consent to conduct PIRLS Literacy 2016. The Ethics Committee of the University of Pretoria then approved the study, after which consent was sought from the other stakeholders in the study. Informed consent was given by the schools, teachers and parents, and informed assent was given by the learners. Individual consent was also required from parents before their children could participate in the study. Learners' names were linked to unique identification numbers to ensure the confidentiality of the learners. This also safeguarded the identity of the school in the national and international database. The NRC upholds the privacy of the data and the primary data is forever stored by the IEA.

2.13 CONCLUSION

PIRLS Literacy 2016 was discussed in this chapter with a description of the IEA's history, as well as the development of PIRLS. For the purpose of the current study, the difference between PIRLS 2016 and PIRLS Literacy 2016 was also discussed, followed by a definition of reading literacy. The chapter then outlined the PIRLS Literacy 2016 assessment framework with reference to the contexts of learning to read, the purposes for reading, processes of comprehension, and learner attitudes and behaviours that affect their reading abilities.

The rest of the chapter comprised the research design and methods, assessment instruments, translation and adaption of instruments, data collection and data analysis, as well as the methodological norms and ethics for the study. This chapter aimed to explain the methodology used specifically in the PIRLS Literacy 2016 study. The methodology for the current study is presented in Chapter 4.

CHAPTER 3
A REVIEW OF LITERATURE

3.1 INTRODUCTION

The purpose of this study was to determine the extent to which South African Grade 4 learners' reading literacy achievement is associated with teacher profiles and teachers' participation in formal and informal professional development activities, when controlling for the socio-economic status of the learners. For this purpose, PIRLS Literacy 2016 South African data were used and the teacher profiles were described in terms of teachers' age, years of experience and formal qualifications.

Chapter 3 presents a review of the literature regarding teacher profiles and teachers' participation in formal and informal professional development in order to gain a better understanding of how learners' reading literacy achievement is affected by these variables.

Section 3.2 of this chapter emphasises the development of reading literacy by distinguishing between literacy and reading literacy. Section 3.3 then discusses the current state of reading literacy in the South African context. The classroom environment is discussed in Section 3.4. As mentioned in Chapter 1, the South African education system has undergone various changes in the past 25 years, which caused various challenges that need to be addressed. These challenges are discussed in Section 3.5. Section 3.6 discusses teacher profiles, followed by a discussion about professional development and professional development opportunities for South African teachers in Section 3.7. As the socio-economic status of learners was controlled for in this study, literature on the topic is also discussed (Section 3.8).

Section 3.9 explains how the literature is related to the conceptual framework developed for the study; it describes the models on which the conceptual framework is based (Section 3.9.1), followed by an explanation of the conceptual framework for the study (Section 3.9.2). Section 3.10 concludes this chapter.

3.2 DEVELOPMENT OF LITERACY AND READING LITERACY

This section elaborates on the concepts of literacy and reading literacy to clarify the differences and the link between the two concepts. Before these concepts are defined, it is important to mention that illiteracy still plays a major role in society, especially in developing countries (Roux, 2015). Illiteracy is related to insecurity and a low self-esteem (Literacy Foundation, 2019). It hinders individuals to operate in society and obtain important information. Illiteracy also limits employment opportunities, which further leads to lower quality jobs and lower income (Literacy Foundation, 2019). Consequently, literacy is vital for individual and community development and it opens doors to educational and employment opportunities (Project Literacy, 2019).

Various definitions of literacy exist. These definitions affect the way in which literate and illiterate people are viewed (Keefe & Copeland, 2011). How literacy is defined is also associated with classroom instruction and literacy opportunities offered to learners (Keefe & Copeland, 2011). Traditionally, literacy instruction only emphasised print literacy (Silvers et al., 2010). Literacy comprised the ability to read and write. The meaning of literacy is constantly changing to accommodate the role of new technology and the ability to communicate in modern day society (Anstey & Bull, 2006).

UNESCO has reviewed its definition of literacy over time to accommodate the changing times. The UNESCO definition now describes literacy as “a continuum of learning enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society” (Montoya, 2018, p. 2). Anstey and Bull (2006) define literacy as the ability to operate successfully in the local and global community in the present and the future. Literacy can therefore be summarised as people’s ability to communicate meaning in any possible way.

The PIRLS Literacy 2016 study focused specifically on reading literacy, which necessitates the distinction between literacy and reading literacy. Reading literacy, as one form of literacy, focuses more on ability. Reading literacy is defined by the Programme for International Student Assessment (PISA) as “the ability to understand, use and reflect on written texts in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate effectively in society” (Delgadova, 2015,

p. 49). The definition of reading literacy also includes the ability to work with different texts (Delgadova, 2015).

The National Assessment of Educational Progress (NAEP)'s definition of reading literacy elaborates on the previous definitions by adding that reading literacy means "knowing when to read, how to read, and how to reflect on what has been read" (Guzzetti, 2007, p. 26).

The PIRLS Literacy 2016 study developed its own definition for reading literacy by combining the definitions of literacy and reading. The study defines reading literacy as:

> *"Reading literacy is the ability to understand and use those written language forms required by society and/or valued by the individual. Readers can construct meaning from texts in a variety of forms. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment"* (Mullis & Martin, 2015, p. 12).

The PIRLS definition of reading literacy is distinctive as it also incorporates the learners' attitudes and behaviours towards reading (Mullis & Martin, 2015). In most cases learners with positive attitudes towards reading are also more capable readers (Roux, 2015).

3.3 READING LITERACY CRISIS IN SOUTH AFRICA

Literacy forms part of the right to education but can also be seen as a mechanism in the strive towards other human rights (UNESCO, 2005b). It is evident that the South African schooling system performs well below its potential (DBE, 2011a). South Africa is experiencing a literacy crisis. The PIRLS Literacy 2016 data revealed that South African Grade 4 learners achieved the lowest results compared with other participating countries (Egypt, Morocco, Kuwait, Iran and Demark) (Howie et al., 2017a), suggesting that South African learners struggle to compete academically with their international peers. In comparison to the previous cycles of PIRLS (2006 and 2011) in South Africa, the current results show little to no improvement (Howie et al., 2017a). Table 3.1 depicts South African learners' reading literacy achievement in the previous cycles of PIRLS (2006 and 2011).

Table 3.1: South African Learners' Reading Literacy Achievement in the PIRLS Studies

PIRLS Cycle	Participating System	Reading Literacy Achievement on the PIRLS Scale	International Scale Centre Point
PIRLS 2006	Grade 4 learners (in all 11 official languages)	253	500
PIRLS 2006	Grade 5 learners (in all 11 official languages)	302	500
PIRLS 2011	Grade 5 benchmarking participants (Afrikaans & English)	421	500
prePIRLS 2011	Grade 4 learners (in all 11 official languages)	461	500
PIRLS 2016	Grade 5 benchmarking participants (Afrikaans, English & isiZulu)	406	500
PIRLS Literacy 2016	Grade 4 learners (in all 11 official languages)	320	500

Note. Data in Table 3.1 were obtained from Howie, et al. (2008); Howie, et al. (2012); Howie, et al. (2017a) and Howie et al. (2017b).[15]

The PIRLS Literacy 2016 results are supported by the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), which assesses the trends in the achievement levels of Grade 6 learners in literacy and mathematics in South Africa. South Africa has been participating in the SACMEQ studies since 2000 (SACMEQ II). As SACMEQ is also a trend study, Table 3.2 summarises the

[15] See Section 2.10 for a discussion of the PIRLS Literacy 2016 achievement scale.

achievement of Grade 6 learners' reading and mathematics achievement in the existing SACMEQ cycles.

Table 3.2: South African Learners' Results in the SACMEQ Studies

SACMEQ Cycle	Participating System	Reading Achievement on the SACMEQ Scale	Mathematics Achievement on the SACMEQ Scale	SACMEQ Scale Centre Point
SACMEQ II (2000)	Grade 6 learners	492.4	486	500
SACMEQ III (2007)	Grade 6 learners	494.9	495	500
SACMEQ IV (2013)	Grade 6 learners	538.3	552	500

Note. Data in Table 3.2 were obtained from DBE (2017).

The SACMEQ Policy Brief (2011) pointed out that the 2007 cycle showed a slight improvement in learner achievement when compared to the 2000 cycle. Contradictory to the PIRLS Literacy 2016 results when compared to previous cycles, SACMEQ IV indicated an upward trend that may be ascribed to the strengthening of the national curriculum between 2007 and 2013 (DBE, 2017).

The literacy crisis is further emphasised by the poor mathematics and science results in the Trends in International Mathematics and Science Studies (TIMSS). As TIMSS is also a trend study, Table 3.3 summarises South African learners' achievement in the existing TIMSS cycles.

Table 3.3: South African Learners' Achievement in the TIMSS Studies

TIMSS Cycle	Participating System	Mathematics Achievement on the TIMSS Scale	Science Achievement on the TIMSS Scale	TIMSS International Scale Centre Point
TIMSS 1995	Grade 8 learners	276	260	500
TIMSS 1999	Grade 8 learners	275	243	500
TIMSS 2002	Grade 8 learners	264	244	500
TIMSS 2002	Grade 9 learners	285	268	500
TIMSS 2011	Grade 9 learners	352	332	500
TIMSS 2015	Grade 9 learners	372	358	500

Note. Data in Table 3.3 were obtained from Reddy et al. (2012) and Reddy et al. (2016).

Additionally, reports by the National School Effectiveness Study (NSES), which tested literacy and numeracy skills, indicated that "South Africa has the worst education system of all middle-income countries" (Ngozo & Mtantato, 2018, para. 8).

Although various policies and programmes, like the Primary School Reading Improvement Programme (PSRIP), the Reading to Lead campaign, the Drop All and Read (DAAR) initiative and the Ramaphosa Reading Plan, have been implemented by the DBE, the efforts have not shown improvement.

South African learners' results in the abovementioned studies are concerning and necessitate further policy improvements and the implementation of programmes that would support the acquisition of literacy and numeracy skills. The classroom environment and the teacher play an important role in learner achievement and are discussed next in Section 3.4.

3.4 THE CLASSROOM ENVIRONMENT IN THE DEVELOPMENT OF READING LITERACY

Delgadova (2015) emphasises that reading literacy is a prerequisite for academic success in all school subjects. The importance of reading instruction for academic success needs to be highlighted. The methods used to teach reading greatly affect learners' ability to obtain the necessary reading skills (Griffiths, 2008). As such, the teacher in the classroom plays an important role in learners' acquisition of reading skills (Opper, 2019; Pearson, 2017; Richland, 2017).

It is important for teachers to provide learners with opportunities to construct their own knowledge by teaching appropriate reading strategies and motivate learners to obtain the expected reading skills (Griffiths, 2008; Wessels, 2010).

A shift from teacher-centred instruction to learner-centred instruction has been emphasised by many authors (DBE, 2011b; Smith, 2017; Vakalisa, 2011; Wessels, 2010). Participative teaching and learner-centred teaching were discussed in Section 1.2. The educational achievement of learners is not only dependent on their own efforts but it is also the result of culturally-situated social interaction (Bergbauer & Van Staden, 2018). Institutions, such as schools, form part of the interactions which are a crucial part of children's learning (Bergbauer & Van Staden, 2018). Many teachers still struggle to implement learner-centred strategies in their classrooms. Therefore, the importance of learner-centred strategies needs to be emphasised. Vygotsky's theory of social interaction clarifies the importance of interaction in the classroom (Wessels, 2010). The social interaction theory describes the contexts in which interactions for learning can take place (Wessels, 2010). The concept of scaffolding is highlighted in Vygotsky's theory of social interaction, in which assistance can be obtained by learners in four different ways:

a) Assistance from peers or adults who are more capable than they are;
b) Interaction with peers with the same abilities than they have;
c) Assisting other learners; and
d) Accessing own inner resources (Wessels, 2010).

The Zone of Proximal Development (ZPD), as depicted in Figure 3.1 below, is accessed when learners understand and access new information beyond their current abilities, through various social interactions (Wessels, 2010).

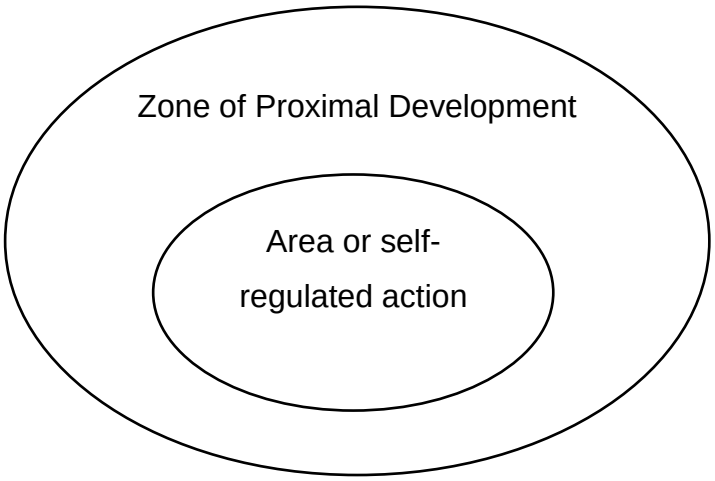

Figure 3.1: Zone of Proximal Development

Note. Adapted from Wessels (2010, p.3).

Specifically applied to language learning and acquiring reading literacy skills, Vygotsky's social interaction theory, as depicted in Figure 3.2, explains the association between social interaction, acquiring language skills and cognitive development.

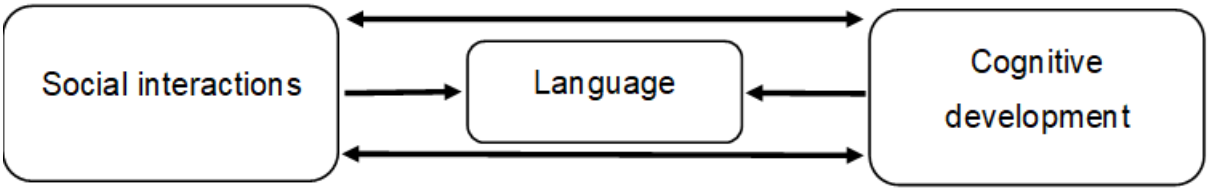

Figure 3.2: Vygotsky's Social Interaction Theory

Note. Adapted from Bergbauer and Van Staden (2018).

Figure 3.2 illustrates the dependence of a learner's cognitive development on language, which is acquired through social interactions.

The classroom itself is a social cultural context where the curriculum is enacted (Bergbauer & Van Staden, 2018). The experiences of the teacher should therefore be capable of creating opportunities for learners to engage in different social interactions. It is the responsibility of the teacher to create an environment for learners to acquire reading literacy skills and also to provide learners with opportunities to practise their reading literacy skills. Teaching of reading forms part of a teacher's training, and although many political, economic and educational changes have occurred in South Africa in the past 25 years, teachers need to adapt to the challenges associated with these changes because they may be related to learners' ability to acquire reading skills, as well as teachers' ability to teach the necessary reading skills. The challenges that have an impact on the South African education system are discussed in Section 3.5.

3.5 MACRO-LEVEL CHALLENGES IN THE SOUTH AFRICAN EDUCATION SYSTEM

As mentioned, multiple changes have occurred in South Africa in the past 25 years (Howie et al., 2017a; Mestry, 2017; Molapo & Pillay, 2018; Van Staden & Howie, 2010). The purpose of education is to improve equality and reject prejudice (DBE, 2011). To achieve these morals, it is important to comprehend the history of South Africa (DBE, 2011a). Motshekga (2019) argues that teachers in the 21st century have a challenging task to adequately prepare learners with the necessary knowledge and skills to actively contribute to society. South Africa is in a state of development, and fiscal constraints and scarcity of skills make teaching an even more challenging task (Motshekga, 2019). The country's political changes have led to other changes and challenges throughout the country. Many of these changes can directly or indirectly be associated with the education system. It is important for the education system and especially teachers to adapt to the changes and challenges to effectively support learners in achieving their full potential.

Challenges that have influenced the education system include political challenges, contextual challenges, language challenges and curriculum challenges. These challenges are discussed in the following sub-sections.

3.5.1 POLITICAL CHALLENGES

Apartheid resulted in prolonged segregation; not only by race, but by language as well (DBE, 2011a). Although reconciliation has been realised, the division is still present as economic inequality still exists (DBE, 2011a). The newly appointed democratic government strived to democratise the South African political culture and move away from the system of apartheid to a system of majority rule (Godinho, 2016). This also required schools to prioritise equal, quality and democratic education, as well as teaching learners about democracy to support the transformation in the country (Godinho, 2016; Harber & Mncube, 2012). It became necessary for the schooling system to consciously make efforts to heal past divisions and inequalities (DBE, 2011a). Democracy entails that all people have equal rights and access to opportunities (Harber & Mncube, 2012). As part of the democratic changes, legislation regarding education was adapted and new legislation was implemented.

The Bill of Rights in the Constitution of South Africa, Act 108 of 1996, states that all children have the right to basic education, including education in the official language of their choice. Other legislation relating to education include: The South African Schools Act (SASA), Act 84 of 1996; the South African Qualifications Authority (SAQA), Act 58 of 1995; the National Education Policy Act (NEPA), Act 27 of 1996; and the National Qualifications Framework (NQF), Act 67 of 2008. The abovementioned legislation is related to the education system as schools were required to adapt to new rules and regulations that affected the structure of schools, admissions into schools, appointment of teachers in schools, the curriculum and the accommodation of learners from different environments.

The political challenges in South Africa could be associated with the contextual challenges faced by the education system because those challenges resulted from the political challenges.

3.5.2 CONTEXTUAL CHALLENGES

The apartheid legacy can not only be associated with the political landscape, but also resulted in contextual and financial inequalities in various communities in South Africa (DBE, 2011a). South Africa's population is the most diverse in the world in terms of income and socio-economic status (Spaull, 2019; World Bank, 2017b). The financial

inequality in the education system is still manifesting after more than two decades after apartheid (Spaull, 2019). Schools that accommodate learners from wealthier families achieve much higher results than schools that accommodate learners from poorer households (Spaull, 2019).

Quintiles[16] capture historical categories as most African schools suffer financial difficulties and are found in quintiles 1–3 (DBE, 2011a). In 2015, 13.8 million people lived in extreme poverty and earned below R441 per person per month (Statistics South Africa, 2017). Furthermore, children aged 17 years or younger are classified under those who are most vulnerable to poverty in society (Statistics South Africa, 2017). The quality of education received under these circumstances is questionable.

It is important to note that in international, large-scale assessments, even quintile 5 schools in South Africa are underperforming (Spaull, 2013). This suggests that the socio-economic status of learners may not be the biggest challenge faced by the South African education system, but it could be the quality of education that South African children are receiving. The teaching force may be wasting a lot of its potential (Spaull, 2013). Spaull (2013, p. 37.) further explains that “the better performing 25 per cent of pupils raise the extremely low average of the bottom 75 per cent”. As a result, national averages are not a true reflection of South African learners’ true performance and abilities (Spaull, 2013).

Access to and participation in the education system are very important to the Government and have improved in the past few years (Howie et al., 2017a). The South African government planned to provide R377.6 billion in 2019/20 to provide equitable access to quality education to all South Africans (National Treasury, 2019). Although the South African government attempts to remedy inequality in the education system, many challenges still exist. It is evident that learners from poorer socio-economic

[16] Quintiles refer to categories in which schools are placed according to their financial position and ability to obtain the necessary finances for the school to function. Quintile 1 schools are fully dependent on financial assistance from the DBE, whereas quintile 5 schools can function independently or with little government financial assistance.

backgrounds struggle academically as they do not have equal access to infrastructure, resources and services (DBE, 2011a; Howie et al., 2017a).

South Africa's political landscape further contributed to language-related challenges faced by schools as political changes required that education should be available in all 11 official languages. These challenges are discussed next.

3.5.3 LANGUAGE CHALLENGES

Another challenge faced by the education system is language. Although language is not part of this study's conceptual framework, it is important to discuss language challenges because such a discussion will shed light on the necessity of teachers' education and their participation in formal and informal professional development activities in order to adapt to the language challenges. The legacy of colonialism continues in terms of the language of learning and teaching (LoLT) at South African schools. English has become the predominant language of textbooks and policy documents, although only 7% of learners in public schools actually speak English (DBE, 2011a). The Bill of Rights in the Constitution of South Africa acknowledges 11 official languages in addition to braille and sign language. As mentioned, the Constitution also strives to deliver education to children in the official language of their choice. Concerning the marginalisation of certain language groups, the schooling system needs to focus particularly on promoting all official languages (DBE, 2011a). Various policies relating to language in education have been developed and implemented to enhance language teaching in schools.

To receive education in one's mother tongue is not only a matter of national pride or liberalisation, but research has also revealed that children learn best when key concepts are taught in their mother tongue (DBE, 2011a). The Language in Education Policy (LiEP) (DBE, 1997) advocates for mother tongue instruction in the Foundation Phase of schooling. However, in many cases learners' LoLT is not their mother tongue or they do not receive adequate education in their mother tongue, which results in comprehension difficulties (OECD, 2019; Roux, 2014).

Recent research conducted by the Organization for Economic Cooperation and Development (OECD) in the Teaching and Learning International Survey (TALIS)

2018 on the topic of professional development indicated that an average of 75% of teachers were trained to teach in a multilingual setting; however, only 67% of teachers felt prepared to teach in such settings (OECD, 2019). Furthermore, 54% of South African teachers engaged in professional development activities related to teaching in a multicultural or multilingual environment and a further 20% reported a high need for such training (OECD, 2019). However, 81% of South African teachers felt capable to cope with the cultural and language challenges, which is more than the OECD average of 67% (OECD, 2019). Although many teachers feel skilled to teach in multilingual and multicultural settings, the language challenges remain a barrier that needs to be addressed. The results from TALIS 2018 may be questionable as learners' low reading literacy results in the PIRLS Literacy 2016 study may be an indication that teachers are not as proficient in teaching in multilingual and multicultural settings as presented in the report. The PIRLS Literacy 2016 results may also suggest that many teachers are not capable of properly teaching reading.

3.5.4 CURRICULUM CHALLENGES

The political, contextual and language challenges faced by the South African education system also resulted in multiple adaptions of the national curriculum. A curriculum can be defined as the knowledge, skills and values taught to learners in the specific time they are at school (Adu & Ngibe, 2014). In South Africa, the curriculum has undergone changes on four occasions: First, the democratic transformation led to Curriculum 2005, which was introduced in 1997. Then followed the Revised National Curriculum Statement (RNCS) in 2002 and the National Curriculum Statement (NCS) in 2007. Currently, schools are following the Curriculum and Assessment Policy Statements (CAPS), which was finally introduced at the end of 2011.

The CAPS curriculum has once again undergone amendments at the end of 2019. Several concerns have been raised since the CAPS was introduced in 2011. The current amendments provide for interim changes made to the assessment programme in the CAPS for Grade R–9 in reaction to the concerns raised by educators. The purpose of these changes is to relieve teachers from the overload of assessment tasks and to promote the focus on teaching and learning (DBE, 2019c).

Not only had new content been introduced in the different curricula, but the required teaching and learning strategies also varied as the focus in the classroom shifted from a teacher-centred approach, to a learner-centred approach (Adu & Ngibe, 2014). These curriculum changes left teachers and school management teams (SMTs) feeling confused (Gulston, 2010). Since the age, years of experience and qualifications of teachers in schools vary, the continuous changes in the curriculum have required teachers to adapt to such changes. Some researchers indicate that teachers are more pessimistic than the DBE about the implementation of the CAPS curriculum as the implementation of the CAPS curriculum is hampered by inadequate training of teachers, the poor involvement of teachers in the curriculum development processes, poor resources, work overload, and teachers feeling unprepared and unsupported (Molapo, 2016; Molapo & Pillay, 2018; Nkambule & Amsterdam, 2018).

Not only do teachers have to adapt to political, curricular, language and contextual challenges, but they also need to adapt to learning barriers in the classroom. Inclusive education advocates for the accommodation of learners with learning barriers. The principle of inclusivity has become more important in the education system. Many learners experience barriers to learning. These barriers could be in the form of physical or cognitive barriers that teachers also have to adapt to. Various policies have been developed and implemented to guide inclusivity. Examples include inclusivity in the Bill of Rights in the Constitution of South Africa, Act 108 of 1996, the Convention of Rights for People with Disabilities, the National Education Policy Act of 1996, the South African Schools Act 84 of 1996, White Paper 6 on Special Education (2001) and the Revised Screening Identification Assessment and Support (SIAS) Policy of 2014. Other policies and guidelines add to the stipulated legislation.

Although the South African government attempts to promote inclusivity in various ways, many learners with disabilities do not attend school or special schools (Donohue & Bornman, 2014). Inclusivity in the education system aims to include learners with physical or learning disabilities in local schools as far as possible, which requires more support and assistance from teachers (DBE, 2014; Nel et al., 2016; Sephton, 2017). This compels teachers to engage in training and support activities to assist them in supporting learners to achieve the necessary outcomes and obtain the required skills.

However, earlier research indicated that 65% of South African mainstream teachers were not formally trained to respond to diverse learning needs (Nel et al., 2016).

The TALIS 2018 report revealed that an average of 29% of South African teachers work in classes where at least 10% of learners experience some kind of learning barrier (OECD, 2019). An average of 67% of teachers were trained to teach in a mixed-ability setting and 67% also felt prepared to teach in such settings (OECD, 2019). However, only 39% of teachers attended professional development activities specifically aimed at special needs education (OECD, 2019).

The results mentioned above are concerning as many teachers are not trained to accommodate learners with learning barriers. Consequently, it necessitates teachers to engage in professional development activities, such as workshops on learning barriers, to adapt to curricular challenges.

3.6 PROFILES OF SOUTH AFRICAN TEACHERS

The national Department of Education views teachers as important role players in the transformation of South Africa (Van Staden & Howie, 2010). Shah and Udgaonkar (2018) describe an effective teacher as “one who is competent, has knowledge and skill and is a performer i.e. he can use knowledge and skill in a classroom to accomplish a teachers’ goal”. Although there are good teachers in South Africa (Hayward, 2012), Robinson (2019, para. 1) claims that “poor quality teachers are holding back South Africa’s education system”. The quality of South Africa’s teaching force is therefore debatable considering the various reports on the quality of teachers in the system.

This study wanted to elaborate on the association between teacher profiles (in terms of age, years of experience and formal qualification) and the reading literacy achievement of South African Grade 4 learners. The teacher profiles are discussed the following sections.

3.6.1 TEACHERS’ AGE

The average age of South African teachers is 43 years (OECD, 2019). The TALIS 2018 study found that 32% of South African teachers are 50 years old and above,

which means that a third of the South African teaching force will have to be renewed over the next decade (OECD, 2019). The aging teaching force is a concern since more teachers are leaving the profession than there are teachers entering the system (Armstrong, 2015; SACE, 2011).

Previous studies regarding teachers' age and the relationship between age and learner achievement indicated that teachers' age can be associated with effectiveness in the classroom (Ismail et al., 2018). However, it is not clear from previous research what the optimum age group is for teachers to obtain the best results from learners.

The SACMEQ III and PIRLS Literacy 2016 studies indicated that teachers younger than 25 years outperform teachers older than 50 years in mathematics and languages (Armstrong, 2015). The ability of teachers younger than 25 years to better elicit performance from their learners could be due to the fact that younger teachers can better relate to learners because they are closer in age (Armstrong, 2015). Teachers younger than 25 years also have higher levels of energy, which contribute to classroom success (Armstrong, 2015). Furthermore, teachers trained in the new system may also be better equipped and more informed about the curriculum (Armstrong, 2015). However, it is necessary to note that a gap in knowledge of learners may occur because teachers younger than 25 years may be more inclined to 'teach to test', whereas teachers older than 50 years want to ensure that learners receive a broader and complete education (Armstrong, 2015).

The results mentioned above are contradictory to studies conducted in other countries. A number of studies have found that teachers younger than 25 years are less effective than more experienced teachers (Burroughs et al., 2019; King Rice, 2010). Some studies report that teachers who are older than 41 years are more effective in the classroom (Ismail et al., 2018). The effectiveness of teachers who are older than 41 years may be related to their richer background of experience, because they have mastered the content and developed good classroom management skills and teaching methods (Kosgei et al., 2013). Both PIRLS 2006 and PIRLS 2011 highlight that learners taught by teachers younger than 29 years and older than 60 years achieved some of the best results (Howie et al., 2008; Howie et al., 2012).

3.6.2 TEACHERS' YEARS OF EXPERIENCE

Teaching experience refers to the number of years that a teacher has worked as a teacher in a classroom (Burroughs et al., 2019). It is important to note that a teacher's age and years of experience are not the same, because teachers could have had a different occupation before starting to teach, or only decided to become teachers at a later stage in their lives. It has been found that teaching experience is related to teaching effectiveness (Howie et al., 2017a; Mullis & Martin, 2017).

Studies on the topic indicated that teachers are most productive in their first few years of teaching, after which their performance levels out (Burroughs et al., 2019; King Rice, 2010; Toropova et al., 2019). Although teachers with more than 20 years of experience may be more effective than teachers with less than 5 years of experience, the effectiveness is not significantly more (King Rice, 2010). Studies also determined that the efficiency of primary school teachers increases with experience and that teacher productivity is enhanced by early career experience (Harris & Sass, 2010). On the other hand, some studies showed that the effectiveness of the most experienced teachers (who are 25 years and older) declined after some point, resulting in less-experienced colleagues to be more effective (King Rice, 2010; Toropova et al., 2019).

Hanover Research (2016) also reports on some key findings regarding teacher experience and learner achievement. The research showed that although teachers with less than five years of experience may initially be less effective, their performance rapidly increases in the first few years of teaching. Research about experienced teachers indicated mixed results. Teachers with more than 20 years of experience may be no more effective than their younger colleagues and, although they do grow professionally, it is at a much slower rate compared to novice teachers. The research further shows that there is a relationship between induction and mentoring programmes, as well as the socio-economic context of the school and the impact of teachers' experience on learner achievement. The research also indicated that novice teachers are more likely to leave the profession than their older, more experienced peers.

3.6.3 QUALIFICATIONS OF TEACHERS

A well-qualified teacher can be seen as one who has obtained a certificate in teaching and held an equivalent of the taught major (Kosgei et al., 2013). However, it is important to note that a formal qualification alone does not indicate a teacher's competency to teach a subject (Kosgei et al., 2013). Courses and training attended may also contribute to content knowledge and knowledge about practice (Kosgei et al., 2013), which emphasises the necessity of teachers' engagement in formal and informal professional development activities[17].

Prior literature suggests that in some cases learner performance increases when the teacher's level of education is higher (Kosgei et al., 2013). On the other hand, research also indicates that advanced degrees do not necessarily lead to improved teacher productivity (Harris & Sass, 2010).

Reports on teacher education indicated that "South African schools have 5 139 teachers who are unqualified or under-qualified" (Savides, 2017). This statement is supported by the TALIS 2018 report (OECD, 2019), which indicated that only one out of four teachers completed any tertiary education. Furthermore, only one out of five teachers obtained a bachelor's degree or higher. Previous cycles of PIRLS also reported on the qualifications of teachers. PIRLS 2006, for instance, showed that only 21% of learners were taught by teachers with a degree or technikon diploma (Howie et al., 2008). Similarly, PIRLS 2011 indicated that 77% of learners were taught by teachers whose highest qualification was post-secondary training (Howie et al., 2012). The TALIS 2018 report (OECD, 2019) mentions that 81% of South African teachers were instructed on subject content, either in their formal studies or during courses attended, indicating however that 19% of South African teachers are not adequately prepared to teach the subjects that they are teaching. Studies also suggest that many teachers do not currently have the content knowledge or pedagogical skills required to effectively teach learners and some are even unable to successfully complete assessments that their learners have to do (Spaull, 2019).

[17] Professional development is discussed in Section 3.7.

Teacher training may also differ, and teachers' content knowledge may not be the same since a shift took place from teacher training in colleges to teacher training in universities (Armstrong, 2015). Previous cycles of PIRLS support this claim. PIRLS 2006 reported that 60% of the teachers who teach Grade 4 learners were trained in now disbanded teacher training colleges (Howie et al., 2008), suggesting that the subject knowledge of some teachers may be outdated. In other words, not all teachers were trained in the same way, and teachers who were trained in teacher training colleges may now be older and not up to date with contemporary content or teaching practices.

The abovementioned statistics are concerning as many teachers are not formally trained to teach the subject matter, especially reading, which requires specific knowledge and skills. Additionally, although quite a few teachers reported that they were instructed on subject content (OECD, 2019), the quality of the instruction is questionable when learners' poor reading literacy results in the PIRLS Literacy 2016 study are considered.

3.7 PROFESSIONAL DEVELOPMENT IN SOUTH AFRICA

Teacher quality is an important matter discussed by researchers all over the world (Chen & McCray, 2012). Various research studies indicate that effective professional development plays an important role in increasing teachers' proficiency in teaching (Chen & McCray, 2012; Desimone, 2009). Originally, teacher satisfaction, commitment to innovation and change in attitude were seen as professional development (Desimone, 2009). However, effective professional development is now seen as activities that expose teachers to new teaching strategies, update their content knowledge, sustain effectiveness and promote growth (Chen & McCray, 2012; Desimone, 2009).

Professional development refers to activities and processes intended to improve teachers' knowledge, methods of instruction, and the learning outcomes of learners (Darling-Hammond, et al., 2017; Kang et al., 2013). Effective professional development can be defined as "development that has a sustainable, positive impact on the quality of teaching and learning" (DBE, 2015). Effective professional development will result in improvements of teachers' knowledge and instructional

practices and higher learner achievement (Wei et al., 2010). Research indicated that the effectiveness of professional development activities is promoted when it meets the following conditions: involves educators in active learning; builds on previous knowledge; stimulates collaboration and interaction; is context-related; promotes critical and systematic reflection, and is teacher driven (DBE, 2015). The importance of teachers' participation in professional development activities needs to be emphasised as it is associated with teachers' learning, methodology of teaching, and learners' learning (Kang et al., 2013).

Teacher development is essential for good quality education (Beckmann, 2018; Burroughs et al., 2019; Kang et al., 2013; Toropova et al., 2019; Wei et al., 2009). However, it still remains a challenge in the South African education system (Mphahlele & Rampa, 2014). Darling-Hammond, et al. (2017) explains that the education system in which professional development happens impacts its' effectiveness. As mentioned before, there have been multiple changes in the education system over the past few years and it is important for teachers to adapt to these changes[18]. In order for teachers to teach effectively and stay up to date with the changes and challenges in the education system, it is crucial for teachers to engage in both formal and informal professional development activities. Professional development is part of a teacher's role in being a lifelong learner (Gulston, 2010). Yet, professional development in the South African context could be viewed as a challenge as the availability of professional development opportunities, as well as the required resources for professional development may be limited (Darling-Hammond, et al., 2017).

The DBE has implemented various policies and programmes regarding teacher development in an attempt to help teachers adapt to the system. Motshekga (2019) mentions the Integrated Quality Management System (IQMS)[19], the Quality Learning and Teaching Campaign (QLTC), professional learning communities (PLCs) and the

[18] See Section 3.5 for a discussion on the challenges faced by the South African education system.

[19] See Section 3.7.1 for a discussion on the IQMS.

development of professional standards as strategies to improve teachers' knowledge and skills.

The Quality Learning and Teaching Campaign (QLTC) is driven by the Code for Quality Education so that all young South Africans receive quality education as a matter of urgency (DBE, 2019b). The campaign strives to make education a societal issue whereby school communities, districts, provincial and national departments could work together (DBE, 2019b). It is the task of the QLTC school committee to monitor and report on how the school functions, discuss school progress and mobilise the community to support the school (DBE, 2008).

Professional learning communities (PLCs) refer to communities that provide the required support for subject advisors, school managers and groups of teachers to collectively determine their own developmental goals and to set up activities to enable them to achieve these goals and drive their development (DBE, 2015). The DBE (2018a) is of the opinion that the attendance of PLC meetings has become increasingly beneficial because teachers report that they receive more support and opportunities for development. The three words are emphasised to form the meaning. The word *professional* stresses the professional attitude that members of a PLC need to adopt regarding improvement of educational practices and learning experiences for learners (DBE, 2015). The word *learning* refers to learning that is based on knowledge from research and knowledge from practice and the word *community* indicates that effective learning takes place collaboratively in a community (DBE, 2015). Schools should support PLCs because they increase a school's ability to achieve improvement in the school. PLCs also help to bridge the gap between theory and practice and allow for the sharing of experiences (DBE, 2015).

The Teaching and Learning International Survey (TALIS) 2018 contributes to the background of professional development in the South African context as the study was specifically aimed at gathering data relevant to the development and implementation of policies focused on school leaders, teachers and teaching, as well as its relation to learners' learning. (OECD, 2019). The TALIS 2018 report indicated that 91% of South African teachers attended at least one professional development activity in the year prior to the study (OECD, 2019). Although 91% is a high percentage, it is still

concerning as the DBE expects all teachers to engage in various professional development activities[20].

The TALIS 2018 report indicated that attending courses and seminars were the most popular types of professional development activities (OECD, 2019). Although professional development based on collaboration between teachers seems to have the most impact, only 67% of teachers engage in such activities (OECD, 2019). South African teachers seem to be satisfied with the training they received, seeing that 88% of teachers reported a positive impact, which also led to higher levels of self-efficacy and job satisfaction (OECD, 2019).

Considering the positive feedback regarding professional development activities, it appears that those activities had a coherent structure, they focused on subject-specific content, they built on prior knowledge and adapted to teachers' personal development needs (OECD, 2019). However, teachers still need professional development in advanced ICT skills, as well as teaching skills in multicultural or multilingual settings (OECD, 2019).

The School Monitoring Survey of 2017 (DBE, 2018a) is another South African study that contributes to the knowledge of teachers' experiences regarding professional development. The study reported that in 2017, on average, South African primary school teachers spent 36 hours per year attending professional development activities, which is notably less than the target of 80 hours a year, but still shows improvement since 2011 (DBE, 2018a). Although some teachers reported that they have been enhanced by professional development activities, others reported that they did not participate in professional development activities, while several schools reported little to no participation in staff development activities (DBE, 2018b).

Some research reported that there are many teachers who do not participate in professional development activities or feel that they do not benefit from such activities (Singh, 2011). Teachers also reported that their schools did not support or monitor them as far as participation in formal and informal professional development activities

[20] See Section 3.7.2 for a discussion on SACE's CPTD system.

is concerned (Bernadine, 2018; DBE, 2018b; Nel et al, 2016). Some teachers also said that they were dissatisfied with the professional development that they receive (Govender, 2018; Mokhele & Jita, 2010). A differentiation in training is necessary since experienced teachers are receiving the same training as less-experienced teachers (DBE, 2018a).

Although it seems that many South African teachers engage in professional development activities, the quality of the professional development activities may be questionable because teachers' engagement in these activities do not improve learner performance, as is evident in the results of PIRLS Literacy 2016. The Department of Education needs to focus on the provision of good quality professional development activities. Furthermore, teachers need to be held accountable if they do not participate in these activities.

Variables in the PIRLS Literacy 2016 teacher questionnaire were used in this study. Since some of these variables relate to initiatives implemented by the Department of Basic Education, those initiatives will be discussed in the sections that follow.

3.7.1 INTEGRATED QUALITY MANAGEMENT SYSTEM (IQMS)

The objectives and procedures of the IQMS are set out in Resolution 8 of 2003. The main objective of the IQMS is to ensure quality public education (Education Labour Relations Council, 2003a). The IQMS plays a role in the performance management of schools (SACE, 2014). It "promotes accountability of teachers and schools" (SACE, 2014, p. 4). The IQMS consists of three programmes, namely Development Appraisal (DA), Performance Measurement (PM) and Whole School Evaluation (WSE) (SACE, 2014). Although it is used by the Department of Basic Education to monitor the overall effectiveness of schools, the IQMS also prepares the environment for teacher development (SACE, 2014). The purpose of the Developmental Appraisal programme is to appraise individual teachers in a transparent manner to determine their strengths and weaknesses, and also to appraise programmes for individual improvement (Education Labour Relations Council, 2003a). The purpose of the Performance Management programme is to evaluate individual teachers for grade progression, affirmation of appointments, salary increases and rewards and incentives (Education Labour Relations Council, 2003). The aim of the Whole School Evaluation programme

is to evaluate the overall effectiveness of a school (Education Labour Relations Council, 2003a).

Various stakeholders are accountable for the implementation of the IQMS in schools. The Senior Management Team (SMT), consisting of the principal, deputy principal and education specialists, ensures that the school is operating efficiently (Education Labour Relations Council, 2003a). The Staff Development Team (SDT) plans, oversees and monitors all quality management processes (Education Labour Relations Council, 2003a). The Development Support Group (DSG) consists of the educator's senior and an immediate peer whose functions are mentoring and support (Education Labour Relations Council, 2003a). The process also entails self-evaluation by the educator to enable sustainability (Education Labour Relations Council, 2003a).

National, provincial and district accountability structures are also in place in the forms of the National Training Team (NTT), the Provincial Training Teams (PTT) and training in schools, provided by district or area officials. These teams are responsible for training at the different levels of the system (Education Labour Relations Council, 2003a).

The concept of professional development becomes evident as it is part of a teacher's personal growth plan (PGP) in the IQMS system. Teachers are expected to engage in formal and informal professional development activities as part of their personal growth plan, but teacher development also contributes to the effectiveness of the entire school.

The SACE implemented the CPTD system to regulate teachers' participation in professional development as part of the accountability of teachers and to provide training in fields in which teachers require more assistance.

3.7.2 SOUTH AFRICAN COUNCIL FOR EDUCATORS' CONTINUOUS PROFESSIONAL TEACHER DEVELOPMENT SYSTEM

The SACE "is a professional council that is established in terms of the SACE Act no. 31" (SACE, 2011). All teachers are required to be registered with the SACE before being allowed to teach. The SACE strives towards excellence in education (SACE, 2011). Part of its mission is to develop teachers who would display professionalism

(SACE, 2019a). The SACE plays a role in the monitoring and evaluation of the provisioning of professional development (SACE, 2011). The SACE is also responsible for implementing the CPTD and to provide teachers with opportunities to attend appropriate professional development activities (SACE, 2011). It expects teachers to take responsibility for their own ongoing professional development (Gulston, 2010).

The SACE's CPTD system approves and endorses professional development providers and it allocates professional development points to the activities (SACE, 2019b). Teachers are required to obtain at least 150 CPTD points in a three-year cycle (SACE, 2019c). Teachers should participate in three different types of professional development activities. CPTD points are awarded according to the length and depth of activities and programmes attended. Type 1 activities are teacher-initiated activities in which teachers choose to engage in professional development activities to enhance their knowledge on a particular topic (SACE, 2019c). Type 2 activities are school-initiated activities that addresses common needs identified by school management (SACE, 2019c). Type 3 activities are activities initiated by the employer, which are, in the case of education, either Provincial Departments of Education or School Governing Bodies (SACE, 2019c). Activities may include attending cluster meetings, being a part of a Professional Learning Community (PLC), reading relevant articles and attending workshops, short courses or skills programmes[21]. CPTD programmes and activities help teachers to become more knowledgeable regarding developments and changes in their specialisation fields (Gulston, 2010).

Generally, professional development is seen as formal activities in which teachers should engage to enhance their knowledge on a particular topic. Workshops, seminars, short courses and skills programmes are usually viewed as professional development. The SACE's CPTD system, however, recognises different types of

[21] The CPTD point schedule is outlined at https://www.sace.gov.za/Documentation/PROFESSIONAL%20DEVELOPMENT%20POINTS%20SCHEDULE.pdf

professional development that are classified under formal and informal professional development for the purpose of this study.

3.7.3 FORMAL PROFESSIONAL DEVELOPMENT

Traditionally, professional development activities were identified as distinct activities, such as college courses and workshops (Kang et al., 2013; Toropova, et al., 2019). Formal professional development can therefore be defined as the participation in organised activities with suitable content and where evidence of attendance is available (The Chartered Governance Institute, n.d.). For the purpose of this study, formal professional development is considered the attendance of conferences, workshops and short courses, and the attainment of qualifications.

3.7.4 INFORMAL PROFESSIONAL DEVELOPMENT

A new situational approach to professional development has come to light as traditional professional development activities were not directly related to the context of the individual teacher's classroom (Kang et al., 2013). Kang et al. (2013) argue that knowledge is developed in the context and culture in which it is used, explaining that teacher development requires engagement in activities that would improve teachers' knowledge about everyday classroom experiences and how to deal with specific situations. Informal professional development can therefore be defined as activities in which an individual engages, such as workplace learning, reading or research (ICSA, 2019). For the purpose of this study (i.e. selecting the applicable variables in the PIRLS Literacy 2016 teacher questionnaire), informal professional development refers to collaboration between teachers in the form of sharing experiences, observing other teachers, discussions, cluster meetings, PLCs and sharing of informational material.

An effective professional learning system would incorporate both formal and informal professional development activities as part of enhancing teachers' pedagogical and content knowledge.

Although PIRLS Literacy 2016 gives no explicit information regarding informal professional development, variables in the PIRLS Literacy 2016 teacher questionnaire will allow for further analysis of data relating to teachers' participation in informal professional development activities.

3.8 SOCIO-ECONOMIC STATUS OF LEARNERS

Since the socio-economic status of learners were controlled for in this study, the socio-economic status of learners is discussed in this section. In Section 3.5.2 it was shown that various inequalities in the education system exist. Researchers have found that learners from disadvantaged backgrounds struggle more than their economically affluent peers to perform well at school (Spaull, 2015). Fobosi (as cited in Gilili, 2020) believes that learners who attend school in rural areas are destined to fail because they do not have access to quality basic education. In many cases learners' right to basic education is deprived, especially when they come from economically disadvantaged backgrounds (Ndimande, 2016).

At the time when the PIRLS Literacy 2016 study was conducted, 87% of public schools in South Africa were no-fee schools (Howie et al., 2017a). Many schools suffer grave shortcomings, which includes poor conditions of school buildings and poor access to water, telephones and electricity (Howie et al., 2017a). Some schools do not even comply with the basic safety norms or have no basic facilities (Howie et al., 2017a). Although poor conditions at home affect learners' ability to learn (Roux, 2015), the quality of education provided at school further affects learners' ability to improve their achievement (Visser et al., 2015). The lack of resources in rural schools contribute to the low pass rate and make it almost impossible to escape from poor circumstances (Gilili, 2020).

3.9 CONCEPTUAL FRAMEWORK

3.9.1 INTRODUCTION

A conceptual framework can be described as an explanation of events in which the relationship between key concepts is indicated (Maree, 2016). It was necessary, for the purpose of this study, to construct a conceptual framework, since no specific theoretical or conceptual framework exists for the relationship between teacher profiles, teachers' participation in professional development activities and learners' reading literacy achievement. The framework for this study was constructed by combining aspects from different frameworks, and was inspired by the work of Chen and McCray (2012) and Desimone (2009).

Chen and McCray (2012) suggest the *Whole Teacher approach* as a conceptual framework for teachers' participation in professional development activities. The *Whole Teacher approach* emphasises teachers' attitudes, knowledge and practice (Chen & McCray, 2012). Teachers' attitudes can be related to their thinking, behaviour, motivation and their willingness to engage in skills development activities (Chen & McCray, 2012). Positive attitudes may lead to more perseverance when faced with obstacles (Chen & McCray, 2012). It is also important to ensure the integration of content and pedagogical knowledge to address the challenges faced by teachers (Chen & McCray, 2012). Teachers' classroom practice is improved when the focus is on the ongoing support of teachers in real classroom situations (Chen & McCray, 2012). Teachers' attitudes, knowledge and practice also relate to the variables that were used for the testing of teachers' participation in informal professional development activities and its association with learners' reading literacy achievement.

Although the model used by Chen and McCray (2012) focuses on professional development of teachers, with the aim of improving learners' understanding of mathematics, the model can also be informative when considering professional development of teachers, aimed at improving learners' reading literacy achievement scores. Figure 3.3 represents teachers' participation in professional development activities to improve achievement in mathematics.

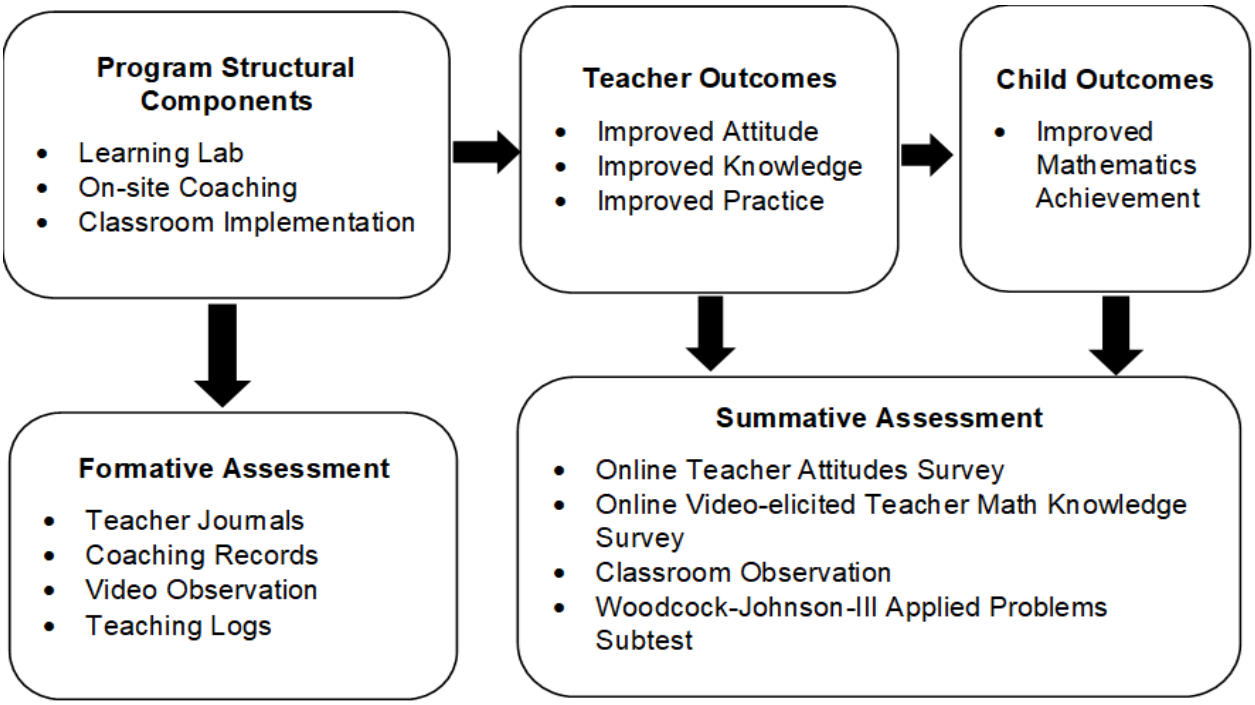

Figure 3.3: Logic Model for the Professional Development of the Early Math Project

Note. Adapted from Chen and McCray (2012)

The model displayed in Figure 3.3 attempts to explain that programme structural components, as well as formative assessment strategies for teachers, can be associated with teacher outcomes, which in turn also have an impact on learner outcomes. Thus, teachers' participation in professional development activities, specifically associated with real life classroom challenges, can also lead to improvement of learner performance.

Desimone's (2009) model is similar to that of Chen and McCray (2012); however, it is a broader representation of the way in which teachers' participation in professional development activities can improve learner performance.

Desimone (2009) stresses that a comprehensive framework for the assessment of professional development should incorporate three aspects, namely, defining effective professional development, explaining how effective professional development affects teachers and learners, and describing the contextual factors associated with

professional development. Figure 3.4 describes the effect of professional development on teachers and learners.

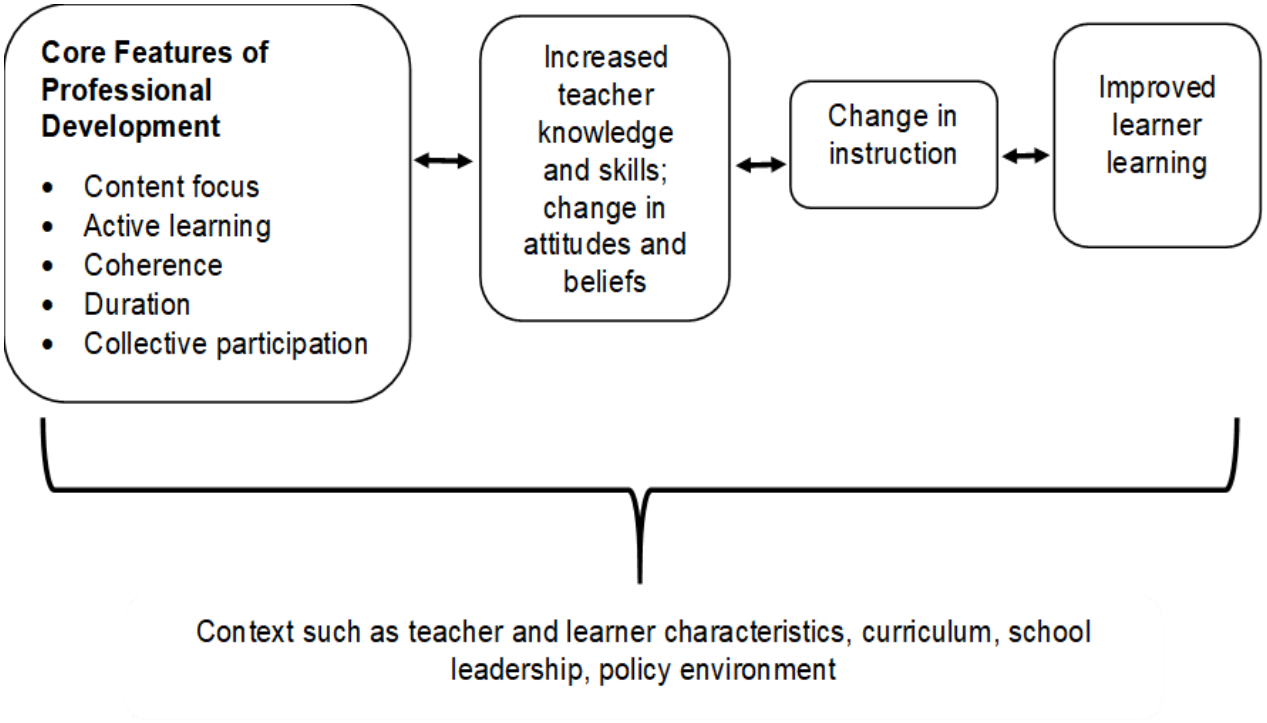

Figure 3.4: Conceptual Framework for Studying the Effect of Professional Development on Teachers and Learners

*Note***.** Based on Desimone (2009).

The framework in Figure 3.4 indicates that effective professional development (considering the core features according to Desimone) leads to increased teacher knowledge and skills as well as change in attitudes and beliefs, which leads to a change in instruction, and finally to improved learner learning.

Various researchers agree that there are five key features that describe professional development: coherence, content focus, duration, active learning and collective participation (Blank et al., 2007; Corcoran, 2007; Desimone, 2011; Kang et al.; Wayne et al., 2008). These features are also part of Desimone's (2009) model.

Content refers to what is learned by teachers through professional development (Kang et al., 2013). Content can be described as knowledge of the subject matter and knowledge of how learners learn (Kang et al., 2013). Active learning relates to the extent to which teachers are engaged in the analysis of teaching and learning activities

(Kang et al., 2013). Active learning can be promoted in the following ways: observing skilled teachers, being observed, scoring assessments, reviewing learners' work and learning, developing and presenting lessons, leading discussions, coaching and mentoring, and interaction between teachers (Blank et al., 2008; Corcoran, 2007; Desimone, 2009; Kang et al, 2013). Coherence can be described as: the consistency of professional development with other teaching and learning activities, teachers' knowledge and beliefs, and state, district and school policies (Desimone, 2011; Kang et al., 2013). Duration refers to the number of contact hours, as well as the length of time in which engagement in the activity lasts (Kang et al., 2013). Collective participation refers to the participation of teachers from the same school in the same types of learning opportunities (Hochberg & Desimone, 2010).

Besides the characteristics that describe professional development, there are various contextual factors that can also be associated with professional development. These contextual factors include: learner characteristics, teacher characteristics, school culture, principal leadership, and the curriculum and assessment system (Kang et al., 2013). These characteristics relate to the contextual challenges faced by teachers, as well as the teacher profiles previously discussed and incorporated into the newly developed conceptual framework for this study.

3.9.2 CONCEPTUAL FRAMEWORK FOR THIS STUDY

Several of the characteristics that form part of the models outlined by Chen and McCray (2012) and Desimone (2009) relate to the conceptual framework for this study. The conceptual framework was inspired by these models but adapted to include the variables specifically required for this study. The conceptual framework was constructed specifically for this study and is presented in Figure 3.5.

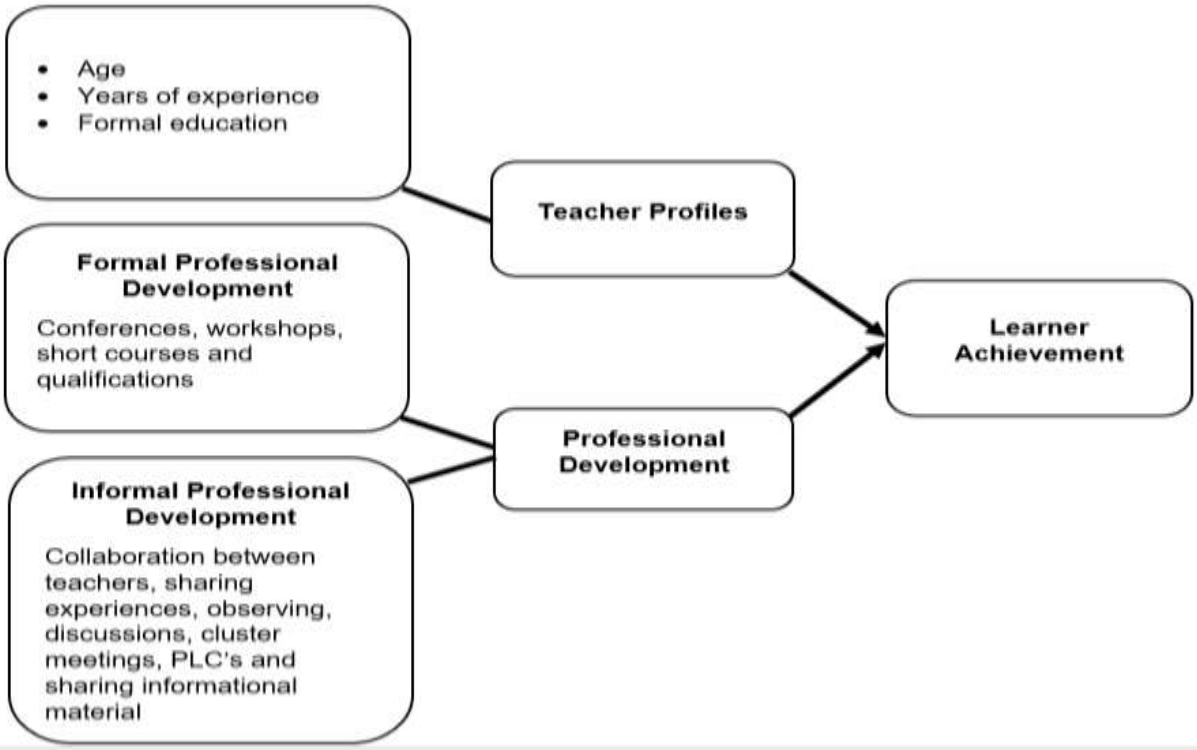

Figure 3.5: Relationship Between Teacher Profiles, Teachers' Participation in Professional Development Activities and Learners' Reading Literacy Achievement

The first component of the framework is teacher profiles. This study specifically considered the association between teachers' age, years of experience and formal education and learners' reading literacy achievement. Various research studies on the topic[22] concluded that teacher profiles may be related to learners' academic performance. The aim of this study was to determine the extent of the relationship between each feature of the teacher profile and Grade 4 learners' reading literacy achievement in the PIRLS Literacy 2016 study.

The second component in the conceptual framework is participation in professional development activities. In accordance with the literature[23], as discussed in Section 3.7, professional development was divided into two categories for the purpose of this study. This study wanted to establish the relationship between teachers' engagement in formal professional development activities (conferences, workshops, short courses

[22] See Section 3.6 on teacher profiles.

[23] See Section 3.7 on professional development.

and the attainment of qualifications) and learners' reading literacy achievement in the PIRLS Literacy 2016 study. The relationship between teachers' engagement in informal professional development activities (collaboration between teachers, discussions, cluster meetings, PLCs, sharing of experiences, sharing of informational material, and observing) and learners' reading literacy achievement in the PIRLS Literacy 2016 study was also explored.

The third variable in the framework presented in Figure 3.5 is learner achievement. The literature suggests that teachers play a crucial role in learners' ability to learn. Figure 3.5 indicates that learner achievement is dependent on both teacher profiles and teachers' participation in formal and informal professional development activities.

Although other aspects, such as teachers' attitudes and beliefs, could also be associated with learner achievement, the conceptual framework only incorporated aspects which directly relate to the current study and the possible variables used in this particular study.

3.10 CONCLUSION

Based on the literature, teacher profiles (teacher's age, years of experience and formal education), as well as teachers' participation in formal and informal professional development activities may be associated with learners' reading literacy achievement. In this Chapter, the challenges faced by the education system were presented since those challenges underline the necessity for teachers to participate in professional development activities. Teacher profiles were then discussed because it is possible to associate certain teacher profiles with learner achievement. Because this study explored the relationship between teachers' engagement in formal and informal professional development activities and learners' reading literacy achievement, the study also examined current professional development structures in South Africa.

The literature emphasised the important role that teachers play in the development of learners' reading literacy skills. Since this study controls for the socio-economic status of the learners, it was also briefly mentioned. This chapter also introduced the conceptual framework for the study, which was inspired by the work of Chen and McCray (2012) and Desimone (2009).

CHAPTER 4
RESEARCH DESIGN AND METHODS

4.1 INTRODUCTION

The intention of this study was to investigate the relationship between Grade 4 learners' reading literacy achievement, teacher profiles, measured by teachers' age, years of experience and formal qualification, and teachers' participation in formal- and informal professional development activities when controlling for the socio-economic status of the learners. It was done by conducting a secondary analysis of the South African Progress in International Reading Literacy (PIRLS) Literacy 2016 study.

The research used a secondary analysis research design because it enabled the researcher to use existing data to enrich the primary research. To obtain a better understanding of South African Grade 4 learners' reading literacy achievement in the PIRLS Literacy 2016 study, this study focused on teacher profiles and teachers' participation in formal and informal professional development activities. A conceptual framework[24], inspired by Chen and McCray (2012) and Desimone (2009), was specifically developed for this study to portray the relationship between teacher profiles, teachers' participation in formal and informal professional development and Grade 4 learners' reading literacy achievement. This secondary analysis aimed to investigate the extent to which Grade 4 learners' reading literacy achievement is associated with teacher profiles (determined by teachers' age, years of experience and formal qualification), and teachers' participation in formal and informal professional development activities, when controlling for the socio-economic status of the learners.

Participation in formal and informal professional development activities, especially in the South African context, emphasises the important role that teachers play in learners' reading development. In this study, the use of secondary analysis might have contributed to certain limitations, for instance, using only data from the primary study

[24] See Chapter 3

for further analysis, and indirect associations between variables may occur. The primary purpose of this study, however, was only to report on and analyse possible *direct* associations between teachers' participation in formal and informal professional development, teacher profiles (as defined by teachers' age, years of experience and formal qualifications), and Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners.

Chapter 2 discussed the methodology for the original PIRLS Literacy 2016 study, while this chapter describes the methodology of this study. Chapter 4 is divided into seven sections: Section 4.2 describes the research paradigm for the study, followed by a discussion about the methodological approach (Section 4.3), the research design (Section 4.4) and the research questions on which the study is based (Section 4.5). Section 4.6 discusses the methods used to conduct the research, including sampling, data collection and data analysis. This section is followed by a discussion of the methodological norms applicable to this study (Section 4.7) and the ethical considerations that were taken into account (Section 4.8). The chapter concludes with Section 4.9.

4.2 RESEARCH PARADIGM

In the social sciences, there are various paradigms that researchers can use to position their research. For the purpose of this study, post-positivism as philosophical paradigm was used as reference for the analysis and interpretation of data. Post-positivism focuses on researching problems through the lens of the representative sample's experiences and announcing results according to what the representative sample deems acceptable (Panhwar et al., 2017). Post-positivism can be seen as a balance between positivist and interpretivist approaches (Panhwar et al., 2017) and it can also be viewed as "a contemporary philosophy of science that emerged from various critiques of logical positivism" as all phenomena require some form of reasoning (Tanlaka et al., 2019). To understand the origin of post-positivism it is necessary to explain the difference between positivism and post-positivism.

Auguste Compte (1798-1857) coined the term *positivism* (Bourdeau, 2018), which was viewed as the leading scientific and technical approach to research in the twentieth century and supported by multiple other researchers (Aliyu et al., 2014). Compte believed that the truth of a phenomenon was confined in strict structures proved by mathematics, physics, biology and chemistry (Bourdeau, 2018). In other words, positivism stresses the need for objectivity in research (Taylor & Medina, 2013). Positivists believe that phenomena can only be measured through the consideration of facts (Roux, 2015) and that absolute truth can only be reached through the establishment of generalisation and laws (Nieuwenhuis, 2016). Consequently, positivists would also only examine social phenomena that they view as factual (Roux, 2015).

Educational researchers started to question positivism because it could not fulfil all the requirements of social science research (Panhwar et al., 2017). Fox (2008) states that positivism can be criticised for various reasons. Firstly, positivism rules out understanding derived through human experiences, reasoning and interpretations – which may lead to a lack of growth in knowledge in social scientific enquiry. Secondly, positivism ignores the context in which the phenomena occur. Thirdly, it becomes problematic to establish one single truth for a phenomenon. Finally, positivism removes subjectivity from research and therefore also reflexivity among researchers.

The scrutiny that positivism underwent resulted in post-positivism. In contrast to positivism, post-positivism believes that an absolute truth does not exist (Panhwar et al., 2017). Post-positivism does not necessarily aim to disapprove of positivism, it just highlights that phenomena should be examined through multiple methods and dimensions to obtain a proper understanding (Panhwar et al., 2017). Post-positivists believe that reality exists, but that it can never be fully understood (Nieuwenhuis, 2016). Post-positivists also stress that objectivity is difficult to achieve, and that research is conducted with an awareness of subjectivity (Nieuwenhuis, 2016). They also emphasise the importance of the consideration of the context in which the research is being conducted. Post-positivism is therefore not a complete rejection of positivism, but merely an elaboration on positivism, which is more cautious when considering one-sided interpretations of data (Adam, 2014).

Post-positivism allows for the analysis and critique of events and concepts and focuses on what can be learned from events and concepts (Sharp et al., 2011). Social sciences deal with the behaviour of people and thus requires the flexibility of post-positivism (Roux, 2015). This study fits into the post-positivist paradigm as it analyses human behaviour and explains certain conclusions drawn from the behaviour. Although the PIRLS Literacy 2016 data are quantitative in nature and need to be analysed using objective scientific methods, post-positivism is a reminder that all research is conducted with an alertness to subjectivity (Nieuwenhuis, 2016). The PIRLS Literacy 2016 study takes into account learners' reading literacy achievement and contextual information to draw conclusions about learner achievement in a social context. Post-positivism allows the researcher to choose between various statistical techniques for analysis and the ability to interpret results in the context of the participants in the study. It is important to note that the research paradigm does not allow for the use of additional data or the adaption of original data because a secondary analysis requires the researcher to use data available from the original study.

4.3 METHODOLOGICAL APPROACH

This study used a quantitative research approach. Quantitative research uses mathematical and statistical methods to analyse data and provide results. This method emphasises "objectivity, numerical data and generalisability" (Maree & Pietersen, 2016a, p. 162) in the analysis of data. This study used descriptive statistics as well as inferential statistics to analyse the data related to the topic. A quantitative research approach was used as a secondary analysis of existing data, which were collected with the aid of teacher and school questionnaires and the learners' assessment score results in the PIRLS Literacy 2016 study. The study was conducted to determine the relationship between teachers' participation in formal and informal professional development activities and learner achievement when controlling for teacher profiles. A quantitative research approach also relates to the epistemological paradigm (post-positivism) that was used as a lens for the study.

4.4 RESEARCH DESIGN

For the purpose of this study, a secondary analysis of the PIRLS Literacy 2016 data was conducted. Secondary data analysis refers to the analysis of "data that was collected by someone else for another primary purpose" (Johnston, 2014. p. 619). Secondary analysis allows the researcher to use existing data to answer a new research question (Cheng & Phillips, 2014). In many cases, an existing data set is not fully explored or used by the original researchers due to limited time, resources or interest (Cheng & Phillips, 2014), allowing other researchers to further explore the data and answer other research questions based on the available data.

Secondary analysis has various advantages. Conducting a secondary analysis of existing data costs less as the data had already been collected and cleaned by the original researchers (Cheng & Phillips, 2014; Johnston, 2014). It also avoids data collection problems (Roux, 2015) and it saves a lot of time (Johnston, 2014). Secondary analysis furthermore allows for the comparison and cross-linking of information from different data sources (Cheng & Phillips, 2014; Johnston, 2014). Available datasets also allow researchers to test new statistical models on real-life data (Cheng & Phillips, 2014). In addition, secondary analysis is beneficial when elaboration is needed regarding a certain topic and can provide new intervention methods for existing problems (Cheng & Phillips, 2014).

Although multiple advantages for secondary analysis exist and it is an under-utilised method (Johnston, 2014), the limitations of secondary analysis have to be considered before using it as the research design for a study. In some cases, only limited data may be available (Vartanian, 2011) since some of the information that the researcher would like to use may not have been collected by the original researchers (Johnston, 2014). Some variables that the secondary researcher would have liked to use may not be available in the existing data (Cheng & Phillips, 2014). Furthermore, the existing data may not relate to the geographic region of interest, the specific time period or the population group in which the researcher is interested (Cheng & Phillips, 2014; Johnston, 2014).

It was mentioned in Chapter 2[25] that the PIRLS Literacy 2016 South African data were made accessible with the permission of the South African NRC. Furthermore, the PIRLS Literacy 2016 Technical Report states that the data had already been cleaned, that it is of good quality and that it had been made ready for statistical use.

The research design took the form of a secondary analysis performed on the PIRLS Literacy 2016 data, and explored the findings from the teacher and school questionnaires that were completed by the teachers and principals of the participating Grade 4 learners. The focus was on teacher profiles, including teachers' age, years of experience and qualification, as well as teachers' participation in formal and informal professional development activities and how these are associated with Grade 4 learners' reading literacy achievement.

4.5 RESEARCH QUESTIONS

This study used the PIRLS Literacy 2016 South African database, in an attempt to answer the main research question:

> **What is the relationship between Grade 4 learners' reading literacy achievement, teacher profiles and teachers' participation in professional development when controlling for the socio-economic status of the learners?**

The teacher and school questionnaires were analysed in this study to ascertain the extent of the relationship between teacher profiles, teachers' participation in formal and informal professional development activities, and Grade 4 learners' reading literacy achievement. The variables, especially in the teacher questionnaire, emphasised the various aspects related to teaching of reading that could be associated with learners' reading literacy achievement. Teachers' engagement in formal and informal professional development activities is required to improve teachers' pedagogical knowledge and knowledge of content.

[25] See Chapter 2 for methods and procedures used in PIRLS Literacy 2016.

A number of statistical methods were used in an attempt to answer sub-questions 1 and 2. The sub-questions, as well as the statistical methods used to derive answers for the questions, are presented in the sections below.

Sub-question 1: *What is the relationship between teacher profiles and learners' reading literacy achievement?*

This question partly relates to the study's conceptual framework since teacher profiles may be associated with learners' reading literacy achievement. It investigated teacher profiles in terms of teachers' age, years of experience and qualification and its relationship with learners' reading literacy achievement while controlling for the socio-economic status of learners. Descriptive statistics and standard multiple regression analysis were used to determine the relationship between teacher profiles and learners' reading literacy achievement.

Sub-question 2: *To what extent is learner achievement associated with teachers' participation in formal and informal professional development activities?*

This question also relates to the study's conceptual framework as teachers' participation in formal and informal professional development activities may be related to learners' reading literacy achievement. Descriptive statistics and a standard multiple regression analysis method were used to determine the relationship between teachers' participation in formal and informal professional development activities and learners' reading literacy achievement.

The PIRLS Literacy 2016 achievement data is reported in terms of plausible values. Plausible values refer to all the combined variables used to estimate the characteristics of the population (Martin et al., 2017). These imputed values resemble individual test scores (Van Staden & Howie, 2010). Plausible values are estimates with a distribution similar to the characteristics being measured and which provides comparable estimates of population characteristics (Khumalo, 2015).

Plausible values are suited to situations where all participants did not respond to all the questions. In the case of PIRLS Literacy 2016, each learner only responded to two reading passages from the range of 16 test booklets, including the PIRLS Literacy

2016 Reader. The overall achievement scores were therefore approximated through the use of plausible values. Since only the teachers who taught the participating sample of learners responded to the teacher questionnaires, plausible values were further used to estimate the teacher population's responses to the variables in the teacher questionnaire.

4.6 RESEARCH METHODS

This section presents the research methods used in this study. It explains the sample for the current study (Section 4.6.1) followed by the methods used in the analysis and interpretation of results (Section 4.6.2).

4.6.1 SAMPLING

Chapter 2 explained the techniques and criteria for the PIRLS Literacy 2016 South African sample. Learners from several countries, in their fourth year of schooling, participated in the PIRLS Literacy 2016 study. Countries had the option to include earlier grades or higher grades as benchmarking participants. The PIRLS Literacy 2016 South African sample consisted of 12 810 Grade 4 learners who were sampled according to province and language of instruction in the Foundation Phase. A total of 293 schools formed part of the attained sample, which included 324 classrooms. Teachers who taught the language of instruction received the teacher questionnaires. Approximately 90% of these questionnaires were returned. The principals of the sampled schools completed the school questionnaires, of which approximately 87% were returned (Howie et al., 2017a).

For the purpose of this study, the Grade 4 data (n = 12 810; 293 schools) were used and included items from the teacher and school questionnaires and achievement data for all Grade 4 learners.

4.6.2 DATA ANALYSIS AND INTERPRETATION

This study analysed the reading literacy achievement data that were collected from the achievement booklets. These achievement booklets tested learners' reading literacy abilities by using a range of reading strategies (Howie et al., 2017a). The reading strategies involved the drawing of conclusions and making certain inferences. The PIRLS studies aim to determine whether learners have moved from learning to

read to reading to learn (Howie et al., 2017a). Multiple-choice questions, as well as constructed response questions were answered, based on the texts provided (Martin et al., 2015).

Four different background questionnaires were used in the PIRLS Literacy 2016 study. Since this study focused on the possible relationship between learner achievement, teacher profiles (determined by teachers' age, years of experience and formal qualification), and teachers' participation in formal and informal professional development, when controlling for the socio-economic status of the learners, only selected variables from the teacher and school questionnaires were used for further analysis. The PIRLS Literacy 2016 achievement data and teacher questionnaire data sets were merged in order to conduct the analyses.

4.6.2.1 Data Used in the Study

Variables related to teacher profiles and teachers' participation in formal and informal professional development activities were used in the data analysis of this study. Teacher profiles and teachers' participation in formal and informal professional development were two of the aspects of the conceptual framework[26]. The variables ranged from specific teacher profiles to background variables that provided insight into teachers' views on and participation in formal and informal professional development activities. Table 4.1 summarises the variables related to teacher profiles, teachers' participation in formal and informal professional development and the socio-economic status of the learners.

Table 4.1: PIRLS Literacy 2016 Teacher Profile Variables

Conceptual Framework Factors	PIRLS Variable Name	Variable Description	Response Scale	Level of Measurement
Teacher Profiles	ATBG03	Age of teacher	Likert scale in age ranges	Nominal

[26] See Chapter 3, Section 3.9.

Conceptual Framework Factors	PIRLS Variable Name	Variable Description	Response Scale	Level of Measurement
	ATDG01	Years of teaching experience	Fill in years of experience	Ordinal
	ATNG04A	Highest level of formal education completed	Select qualification level	Nominal
Socio-economic Status of the School	ATBG03A & ATBG03B	Learners attend disadvantaged or affluent schools	Select percentage range	Nominal
Formal Professional Development	ATBG06	Hours spent in seminars	Likert scale in hour ranges	Nominal
	ATXGO6B	Currently registered for a qualification related to your area of specialisation	Yes/No	Nominal
Informal Professional Development	ATBG07E	Collaboration with others to plan instruction	Likert scale in frequency ranges	Nominal
	ATBG09A	Sharing of teaching experiences	Likert scale in frequency ranges	Nominal
	ATBG09B	Observing other teachers	Likert scale in frequency ranges	Nominal

Conceptual Framework Factors	PIRLS Variable Name	Variable Description	Response Scale	Level of Measurement
	ATBG09C	Working together on a particular topic	Likert scale in frequency ranges	Nominal
	ATBG09D	Working with teachers from other schools on the curriculum	Likert scale in frequency ranges	Nominal
	ATBG09E	Working with teachers from other grades to ensure continuity in learning	Likert scale in frequency ranges	Nominal
	ATBG09F	Setting goals and monitoring achievement	Likert scale in frequency ranges	Nominal
	ATBG09G	Sharing informational materials	Likert scale in frequency ranges	Nominal
	ATBG09H	Attending cluster meetings	Likert scale in frequency ranges	Nominal

The variables listed in Table 4.1 were selected from the teacher and school questionnaires and were based on the study's conceptual framework.

When conducting a secondary analysis, various statistical methods could be used. The following section (Section 4.6.2.2) discusses the statistical programmes used for the data analysis of this study, while Section 4.6.2.3 gives an overview of descriptive statistics and inferential statistics.

4.6.2.2 Statistical Programme Used for the Study

The International Database (IDB) Analyzer and the Statistical Package for Social Sciences (SPSS) software were used to analyse the data for this study. The IDB Analyzer was developed by the IEA Data and Research Processing Centre and is a tool that can be utilised to "combine and analyse data from all IEA's large-scale assessments" (IEA, n.d., para. 1). The programme can handle multiple plausible values, which enables the testing of hypotheses between datasets with any programming code (Roux, 2015). The IDB Analyzer is further able to merge various datasets, which can then be analysed. The IDB Analyzer also accommodates the complex sample design of PIRLS and the sample stratification of the PIRLS Literacy 2016 data. The IDB Analyzer provides more accurate estimates than other statistical software such as SPSS as it takes stratified sampling techniques into consideration (Roux, 2015).

The descriptive statistics for this study, as well as the multiple regression analysis were computed with the IDB Analyzer. Additionally, SPSS software aided in the analysis of the data for this study. SPSS offers a platform for advanced statistical analysis. SPSS software was used to analyse the reliability of the variables chosen for this study.

4.6.2.3 Overview of Statistics Used in this Study

The following sub-sections explain the descriptive statistics (Section 4.6.2.3.1) and the inferential statistics (Section 4.6.2.3.2) used in this study.

Descriptive Statistics

Descriptive statistics refer to various statistical methods that are used to summarise and organise data in a meaningful way (Pietersen & Maree, 2016b). Descriptive statistics were used to obtain answers to the sub-research questions (Section 4.5) and to indicate the variance[27] in South African Grade 4 learners' reading literacy achievement. This study utilised descriptive statistics such as means, percentages, and standard error together with the IDB Analyzer to determine the number of learners taught by teachers by way of displaying the selected teacher profiles, as well as the

[27] Variance refers to the spread of data around the mean (Field, 2018).

number of learners taught by teachers who participated in formal and informal professional development activities (see Chapter 5).

Inferential Statistics

Pietersen and Maree (2016c) state that inferential statistics are based on probability theory. For the purposes of this study, multiple regression analysis was used for further analysis of the PIRLS Literacy 2016 data and to assist in answering this study's research questions.

This section elaborates on the scaling of variables for the reliability analysis and the multiple regression analysis, principal component analysis and the multiple regression analysis itself.

Scaling of variables selected for this study

For the purposes of the reliability analysis and the multiple regression analysis, the selected variables had to be rescaled and recoded to prevent errors in the data (Van Staden, 2016). SPSS software was used to transform the selected variables into scales.

Items from the PIRLS Literacy 2016 teacher questionnaire were recoded into new items. The new items were coded in terms of high or low participation in formal and informal professional development activities. The recoded items are also listed in Table 4.2. Figure 4.1 shows an example of an item from the PIRLS Literacy 2016 teacher questionnaire.

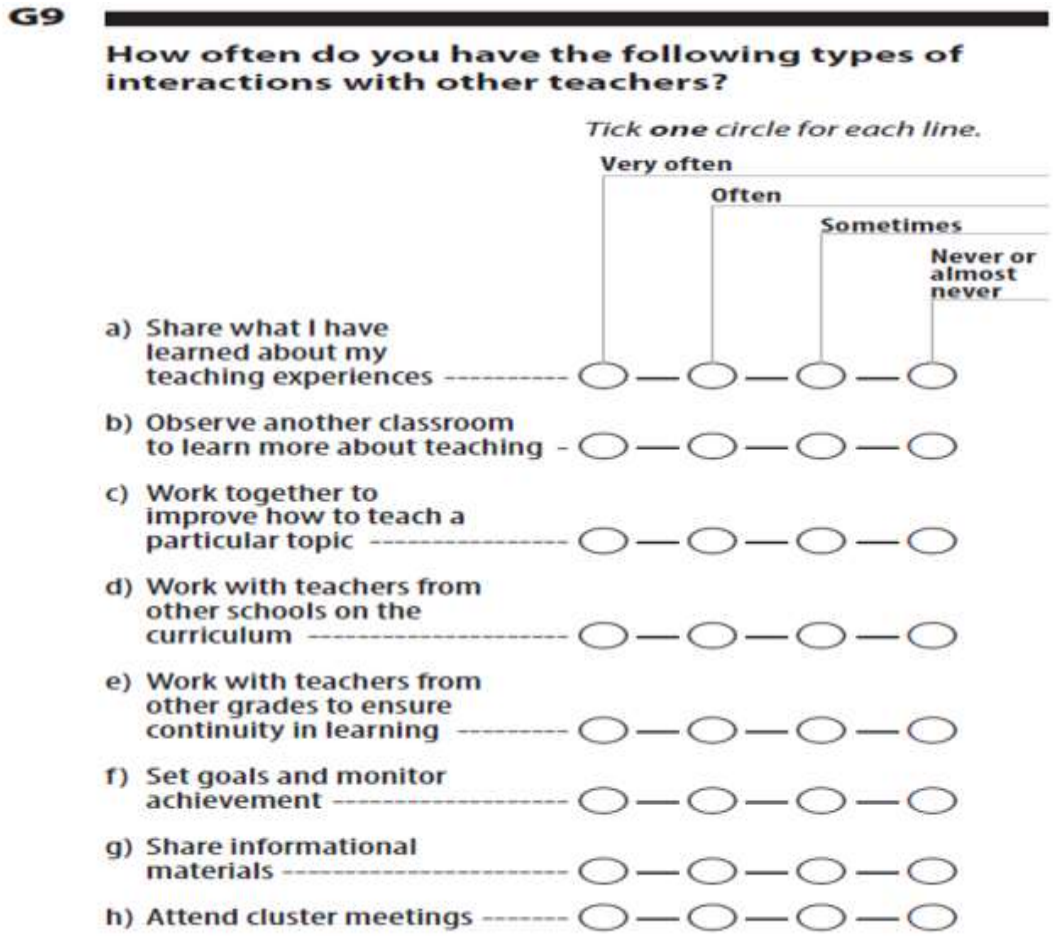

Figure 4.1: Question G9 of the PIRLS Literacy 2016 Teacher Questionnaire

The response options *Very often* and *Often,* as shown in Figure 4.1, were recoded as *High* and the response options *Sometimes* and *Never or almost never* were recoded as *Low*.

Table 4.2 shows the variables and the original response options together with the recoded response options. The variables were used in the current analysis as teacher professional development scales and teacher profile scales. Transforming the variables into scales ensured a more robust measurement of the constructs at hand, instead of using individual variables from the original dataset.

Table 4.2: Variables Used in this Study

Conceptual Framework Aspects	Variable Description	PIRLS Variable Name	Original Response Options	Recoded Scale Options
Teacher Profiles	Years of teaching experience	ATDG01	1 = 20 years or more 2 = At least 10 but less than 20 years 3 = At least 5 but less than 10 years 4 = Less than 5 years	Response options stayed the same
	Age of teacher	ATBG03	1 = Under 25 2 = 25-29 3 = 30-39 4 = 40-49 5 = 50-59 6 = 60 or more	Response options stayed the same
	Highest level of formal education completed	ATNG04A	1 = Did not complete Grade 12 2 = Grade 12 3 = Post-secondary training 4 = Technikon diploma	0 = Under-qualified (1, 2, 3 and 4[28])

[28] Post-secondary training and a technikon diploma were categorised as under-qualified because the minimum requirements for teaching is either a four-year Bachelor's degree in Education or a three-year bachelor's degree with a Post Graduate Certificate in Education (DBE, 2019d).

Conceptual Framework Aspects	Variable Description	PIRLS Variable Name	Original Response Options	Recoded Scale Options
			5 = Bachelor's degree 6 = Honours degree 7 = Master's degree 8 = Doctoral degree	1 = Qualified (5, 6, 7 and 8)
Socio-economic Status of Learners	Economically disadvantaged background	ACBG03A	1 = 0-10% 2 = 11-25% 3 = 26-50% 4 = More than 50%	0 = Less than 50% (1, 2 and 3) 1 = More than 50% (4)
	Economically affluent background	ACBG03B	1 = 0-10% 2 = 11-25% 3 = 26-50% 4 = More than 50%	0 = Less than 50% (1, 2 and 3) 1 = More than 50% (4)
Formal Professional Development	Hours spent in seminars	ATBG06	1 = None 2 = Less than 6 hours 3 = 6-15 hours 4 = 16-35 hours 5 = More than 35 hours	0 = Low (1,2 and 3) 1 = High (4 and 5)
	Currently registered for a	ATXGO6B	1 = Yes 2 = No	1 = High (Yes) 0 = Low (No)

Conceptual Framework Aspects	Variable Description	PIRLS Variable Name	Original Response Options	Recoded Scale Options
	qualification related to your specialisation			
Informal Professional Development	Collaboration between school leadership and teachers to plan instruction	ATBG07E	1 = Very high 2 = High 3 = Medium 4 = Low 5 = Very low	1 = High (1 and 2) 0 = Low (3, 4 and 5)
	Sharing of teaching experiences	ATBG09A	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)
	Observing other teachers	ATBG09B	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)
	Working together on a particular topic	ATBG09C	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)
	Working with teachers from other schools on the curriculum	ATBG09D	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)

Conceptual Framework Aspects	Variable Description	PIRLS Variable Name	Original Response Options	Recoded Scale Options
	Working with teachers from other grades to ensure continuity in learning	ATBG09E	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)
	Setting goals and monitoring achievement	ATBG09F	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)
	Sharing informational materials	ATBG09G	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)
	Attending cluster meetings	ATBG09H	1 = Very often 2 = Often 3 = Sometimes 4 = Never or almost never	1 = High (1 and 2) 0 = Low (3 and 4)

The variables relating to learners' socio-economic background (ACBG03A and ACBG03B) and teachers' level of formal qualification (ATNG04A) were transformed into scales.

Even though the formal and informal professional development variables were rescaled individually, new scales were further developed for the multiple regression analysis. All the variables relating to formal professional development were combined to form one new variable: *Formal professional development*; and all the variables

relating to informal professional development were combined to form one new variable: *Informal professional development*.

Accordingly, in the multiple regression analysis, the formal professional development scale and the informal professional development scale were used as continuous variables. All the other variables, namely *teachers' age*, *years of teaching experience*, *teachers' formal qualification*, *learners from disadvantaged backgrounds* and *learners from affluent backgrounds*, were used as categorical variables.

Principal Component Analysis

After establishing the reliability of the selected items, SPSS was used to perform principal component analysis (PCA). Pietersen and Maree (2016) explain that factor analysis is used to determine which variables belong together. PCA attempts to explain the maximum amount not only of common variance, but of the total variance (Field, 2018).

As part of developing scales for formal and informal professional development, PCA was critical in determining whether the variables selected correlated with one another. PCA aimed to determine whether the factor loading(s) were meaningful and understandable. The criteria for the factor loadings are .162 (Field, 2018), because this study's sample consisted of more than 300 participants. Furthermore, the adequacy of the sample was tested through the use of the Kaiser-Meyer-Olkin (KMO) measure. Since this study's sample was more than 300, the KMO measure is greater than 0.5. The Bartlett's test of sphericity, along with KMO, indicate the difference between the correlation matrix and the identity matrix (Field, 2018).

The scree plot was used to portray a visual representation of the components which explained the most variance. The point of inflexion where the slope of the graph changes drastically suggests the cut-off point for the retaining of factors (Field, 2018).

Oblique rotation was used in this study as correlation between variables is expected and is quicker to compute than direct oblimin rotation (Field, 2018). The *Extraction* column in the *Communalities* table was examined to determine how many components should be extracted during the analysis.

Multiple Regression Analysis

Multiple regression analysis is used to predict the value of an item based on the values of other items (Laerd Statistics, 2018). It can thus be used to predict learners' reading literacy achievement as outcome by using various predictor variables (Khumalo, 2015). The purpose of the linear model is to find a linear combination of predictors that correlate highly with the outcome variable (Field, 2018). Generally, the model is represented as follows:

$$Y_i = (b_o + b_1X_{1i} + b_2X_{2i} + \cdots + b_nX_{ni}) + \varepsilon_i$$

The explanations for the above symbols are presented in Table 4.3.

Table 4.3: Multiple Regression Analysis Model – Symbols Explained

Symbol	Explanation
Y_i	Outcome variable
b_o	Constant or intercept
b_1	Coefficient of the first predictor
X_{1i}	First predictor
b_2	Coefficient of the second predictor
X_{2i}	Second predictor
b_n	Coefficient of the *n*th predictor
X_{ni}	*n*th predictor
ε_i	The difference between the predicted and observed value of Y for the *i*th participant.

Note. Adapted from Field (2018).

It is assumed that each of the variables selected from the PIRLS Literacy 2016 teacher and school questionnaires could in some way be associated with learner achievement. Combined, the variables as scales could have an effect on learner achievement. Figure 4.2 illustrates the possible associations between learner achievement, teacher profiles and teachers' participation in formal and informal professional development.

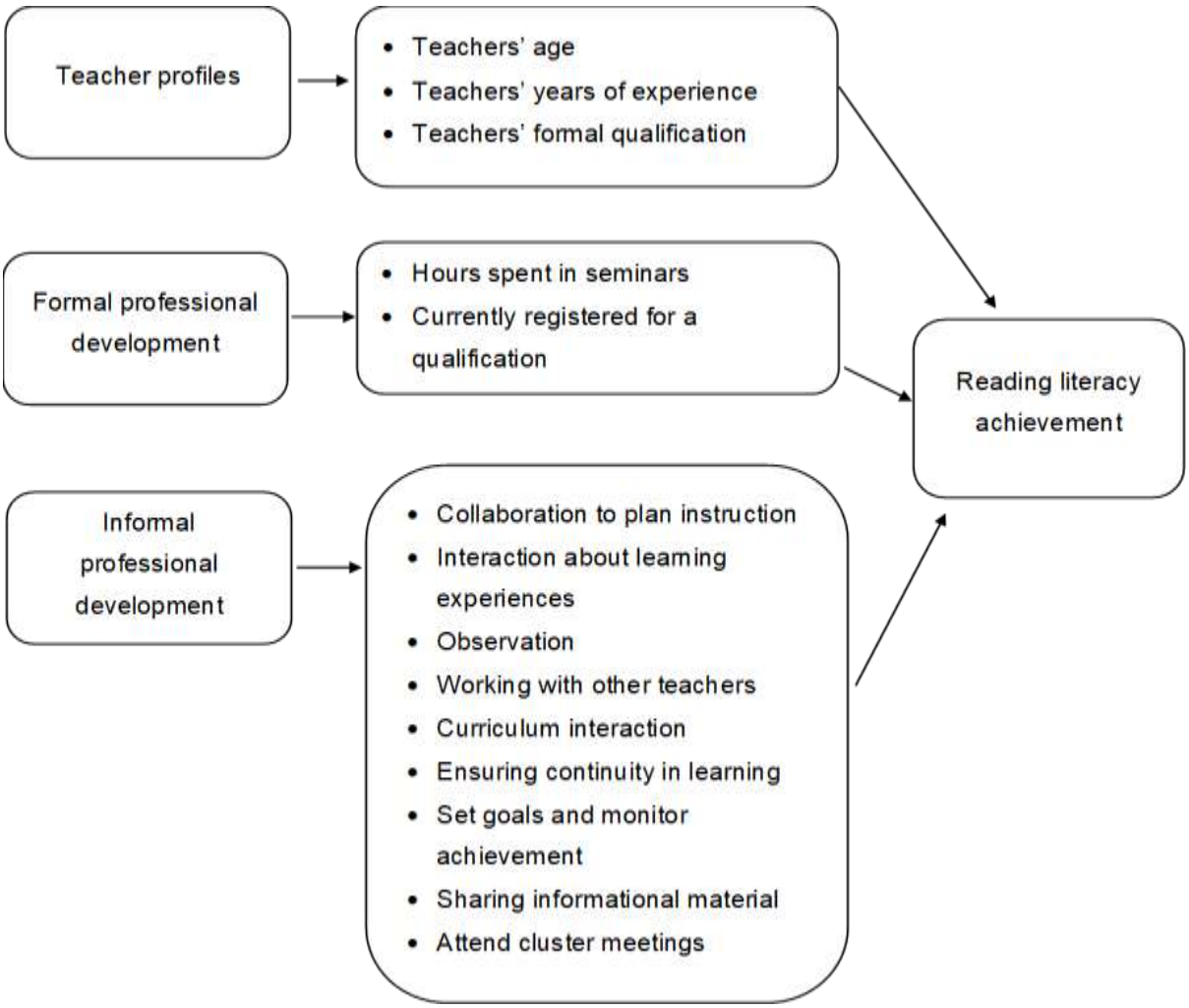

Figure 4.2: Predictor Variables That May Have an Effect on Learner Achievement

Considering the multiple regression model explained in Table 4.3, Y (the outcome) in this case represents learner achievement while b_o is the intercept that describes the mean reading achievement when controlling for all the other variables. The symbol b_n represents the coefficients of each of the various predictors, which in this case refer to the formal and informal professional development variables as well as teacher profile variables, while ε_i indicates the associated error in the model.

The purpose of the multiple regression analysis was to obtain the sum of squares, R and R^2 to determine how much variance in the Grade 4 learners' reading literacy achievement results could be explained by this statistical model. Furthermore, the multiple regression analysis also indicates how the mean score for this specific model would change depending on the input variables in the model, as well as the statistical

significance of each variable in the model. IDB Analyzer was used to run the multiple regression analysis. Thorough explanations and the answers to the research questions are provided in Chapter 6.

When conducting the multiple regression analysis in IDB Analyzer, the first step is to select the appropriate weight. For the purpose of this study's regression analysis, the total student weight (TOTWGT)[29] was selected. The dependent variable is the overall reading achievement score (ASRREA01-05) of the Grade 4 learners' reading literacy achievement and the independent variables were the various predictor variables (see Figure 4.1). The selected predictor variables were recoded to begin at zero, as for any regression. The outputs interpreted for this study's multiple regression analysis are presented in Table 4.4.

Table 4.4: Multiple Regression Analysis Outputs Interpretation

Description	Output
Descriptive statistics	The mean, as well as the standard deviation for each variable is presented in the descriptive statistics table.
Model statistics	R^2 and adjusted R^2, as well as the standard error associated with each, are present in the model statistics table.
Regression coefficient output	This table includes the constant, the predictor variables, regression coefficients, standard errors and t-values of each predictor variable. The regression coefficients, in conjunction with the t-values, are used to determine whether the predictor variables are significantly associated with the overall mean scores of South African Grade 4 learners. The coefficient may be considered as significant at a 95% confidence interval when the t-value is above 1.96 and if the t-value

[29] See LaRoche (2017).

Description	Output
	is above 2.58, the coefficient is significant at a 99% confidence interval (Roux, 2015).

The methodological norms, which includes issues such as validity and reliability, as well as the limitations for this study, follow in the next section.

4.7 METHODOLOGICAL NORMS

Validity is explained in Section 4.7.1, followed by a discussion of *reliability* in Section 4.7.2. The limitations of the study are presented in Section 4.7.3.

4.7.1 VALIDITY

This study used data from the PIRLS Literacy 2016 study. These data sets are considered valid because PIRLS is a trend study conducted in five-year cycles, originally conducted under the auspices of the IEA in 2001 (LaRoche et al., 2017). Chapter 2 discussed the validity of PIRLS Literacy 2016, which included content and construct validity. Content and construct validity were ensured because the assessment booklets and the contextual questionnaires were verified and quality assured, both nationally and internationally (Howie et al., 2017a). The validity of the original study was also accepted for the purpose of this study, since the PIRLS Literacy 2016 data met the highest quality standards (Johansone & Wry, 2017).

In this study, construct validity was ensured because the variables that were selected from the PIRLS Literacy 2016 data adequately tested the study's theoretical constructs. Therefore, the selected variables from the PIRLS Literacy 2016 data allowed the current study get answers to the to the research questions. The variables used also adhere to content validity as the primary study's quality assurance team analysed the items and performed quality control.

4.7.2 RELIABILITY

The Cronbach's Alpha coefficient, which provides a reliability estimate, ensures the reliability of PIRLS as an international study. The current study also made use of the Cronbach's Alpha coefficient to ensure that selected items from the teacher

questionnaire for the standard multiple regression was reliable and, in some cases, recoded to ensure that it adequately measured attitudes and behaviour of teachers (see Chapter 6). The reliability of items for the original PIRLS Literacy 2016 study was obtained through the use of Cronbach's Alpha (α) as well as further cross-country scoring between countries that use the same testing language, such as English (Foy et al., 2017).

Reliability analysis was conducted to determine whether the selected teacher questionnaire variables, related to formal and informal professional development, should be retained for further analysis. "Reliability means that a measure should consistently reflect the construct that it is measuring" (Field, 2018, p. 821). In addition, Pietersen and Maree (2016c) explain that reliability refers to the instruments used for data analysis. The authors clarify that if the same instrument were to be administered to different respondents the findings should still be the same. In other words, reliability refers to the dependability and consistency of the results of an assessment (Gareis & Grant, 2015).

Different degrees of reliability are required depending on what the instrument is used for (Pietersen & Maree, 2016c). Generally, estimates of 0.80 are seen as acceptable, whereas values lower than 0.60 are seen as unacceptable (Pietersen & Maree, 2016c). Field (2018) argues that a coefficient below 0.7 may still be acceptable due to the variance in the constructs being measured. PIRLS Literacy 2016 used a survey research, thus using SPSS software, Cronbach's Alpha (α) was used to determine the reliability of the selected variables. The results of the reliability analysis for this study is presented in Chapter 6.

4.7.3 LIMITATIONS

Because this study used a secondary analysis as a research design, the research was limited to data that had been collected in the original PIRLS Literacy 2016 study. The current research experienced the following limitations:

- Although there is a possibility that indirect associations between variables exist, it was not the intention of the study to examine indirect associations. This study aimed to analyse and report on possible direct associations between teachers'

participation in formal and informal professional development activities, teacher profiles (in terms of teachers' age, years of experience and formal qualification), and Grade 4 learners' reading literacy achievement when controlling the socio-economic status of the learners.

- There is no specific theoretical or conceptual framework for the association between teacher profiles, teachers' participation in formal and informal professional development activities and learners' reading literacy achievement. Consequently, a new conceptual framework was developed for the purpose of this study.

4.8 ETHICAL CONSIDERATIONS

The Minister of Basic Education, Angie Motshekga, granted permission to the University of Pretoria to conduct the PIRLS Literacy 2016 study. Thereafter, the Centre for Evaluation and Assessment (CEA) received ethical clearance from the University to perform the PIRLS Literacy 2016 study. For this study, the CEA granted permission to the researcher to use the PIRLS Literacy 2016 data for a secondary analysis. The Ethics Committee of the Faculty of Education at the University of Pretoria provided ethical clearance for the study (EDU032/19). The data were used and reported in an honest manner, without attempting to change existing data, and to avoid bias towards the intended study.

The participants in the original study were protected through confidentiality and anonymity since access to individual names of learners in a secondary analysis of the data is impossible. The NRC of South Africa preserves the confidentiality of the sample. No school or individual is identified in this dissertation. All documentation and information regarding the study will be stored for at least 15 years and access to the information will be password protected and encrypted in a secure place. PIRLS Literacy 2016 data, including that of South Africa, are permanently stored by the IEA.

4.9 CONCLUSION

The purpose of this chapter was to inform the reader about the methodologies used to conduct a secondary analysis of the PIRLS Literacy 2016 data in an attempt to answer this study's research questions. To fully comprehend the association between

the methodology of this study undertaken by the researcher and the methodology of the PIRLS Literacy 2016 study, this chapter needs to be read in conjunction with Chapter 2. This study is a secondary analysis of PIRLS Literacy 2016. The purpose of a secondary analysis is to elaborate on previous research without collecting additional data to suit the study's aims and research questions.

This chapter described how the research was performed in order to attempt to answer the research questions. Selected items from the teacher and school questionnaire data, as well as the Grade 4 learners' reading literacy achievement data were used in this study. The study's sample consisted of 12 810 Grade 4 learners. The data used in this study were already collected during the PIRLS Literacy 2016 study. Multiple statistical methods were used to analyse the data. Items were selected and examined through the use of descriptive and inferential statistics.

CHAPTER 5
DESCRIPTIVE FINDINGS RELATED TO TEACHER PROFILES AND TEACHER PROFESSIONAL DEVELOPMENT ACTIVITIES

5.1 INTRODUCTION

In this chapter, the descriptive findings from the secondary analysis of the PIRLS Literacy 2016 questionnaire data, completed by the teachers and principals of the participating South African Grade 4 learners, are presented. This chapter describes the variables used to answer this study's research questions, as stated in Chapter 1, to better understand the regression analysis that is presented in Chapter 6. In the first place, it was important to describe certain teacher profiles related to this study, as well as teachers' participation in formal and informal professional development activities, in preparation for further analysis in Chapter 6.

Section 5.2 presents a summary of the PIRLS Literacy 2016 achievement data that were used in the analysis of the teacher profiles (in terms of their age, years of experience and formal qualifications), and teachers' participation in formal and informal professional development. Section 5.3 discusses teacher profiles by referring to the relationship between the mentioned achievement data and teachers' age (Section 5.3.1), teachers' years of experience (Section 5.3.2), and teachers' formal education (Section 5.3.3). Section 5.4 describes teachers' participation in formal professional development activities (Section 5.4.1) and informal professional development activities (Section 5.4.2) and the association with the stated achievement data. Since this study controls for the socio-economic status of the learners, the descriptive statistics are also presented in Section 5.5. Section 5.6 concludes this chapter.

5.2 SOUTH AFRICAN GRADE 4 LEARNERS' READING LITERACY ACHIEVEMENT

The reading literacy achievement scores of South African Grade 4 learners were required for further analysis of variables related to teacher profiles and professional

development. As discussed in Chapter 2[30], the achievement data were collected through the completion of the achievement booklets, which included reading comprehension passages and questions based on the processes of comprehension. The activity of reporting the PIRLS Literacy 2016 achievement data was mainly based on item response theory (IRT) to scale the achievement results. IRT scaling made it possible to produce average scores based on all the learner responses while considering the difficulty and discriminating powers of each item. IRT scaling was developed by Frederic Lord in the late 1950s (Zanon et al., 2016). IRT was used because it is capable of estimating learners' assessment scores, even though all learners did not respond to all the items in the assessment pool[31], based on learners' ability and item difficulty (Martin et al., 2017).

Plausible value (PV) methodology[32] was used to produce the achievement scores, as presented in the PIRLS Literacy 2016 report, and which was also used in analyses in this study. The PIRLS Literacy 2016 average score was set at 500[33] and the standard deviation at 100 (Martin et al., 2017). The scale enables different countries to compare their learners' reading literacy achievement. Figure 5.1 depicts South African Grade 4 learners' reading literacy achievement mean score compared to that of other countries that participated in the PIRLS Literacy 2016 study.

[30] Chapter 2 provides a thorough explanation of the collection and analysis of the achievement data.

[31] See Chapter 2, Section 2.6 for a discussion on the matrix-sampling design used in the PIRLS Literacy 2016 study.

[32] See Chapter 2 for details.

[33] The PIRLS scale ranges between 100 and 800.

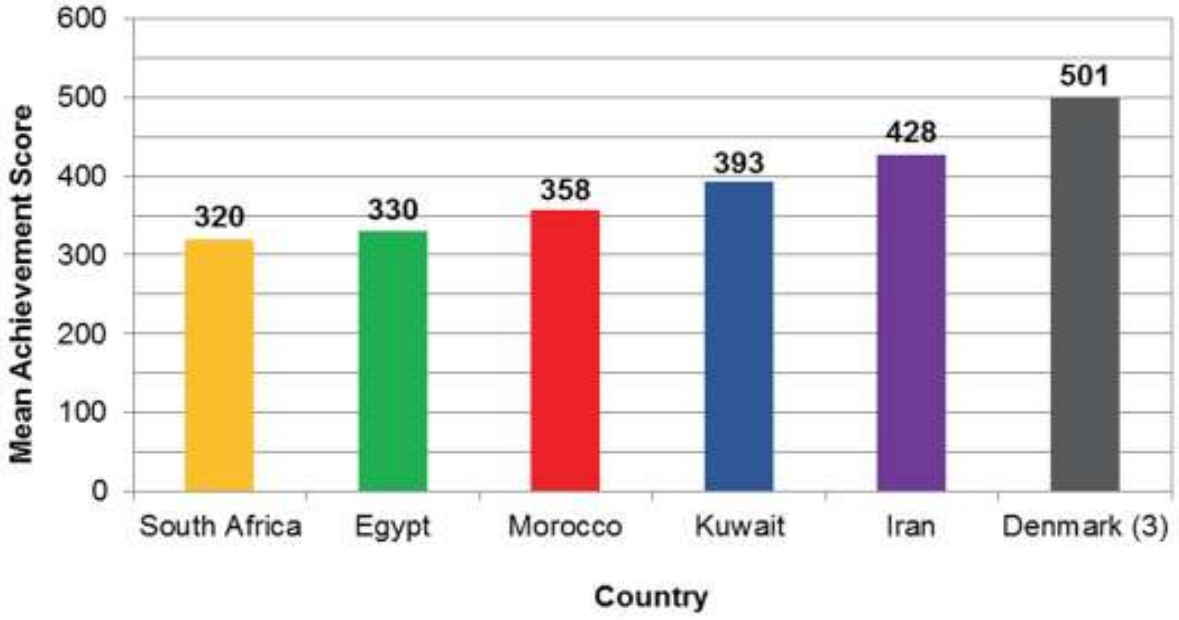

Figure 5.1: Reading Literacy Achievement of Countries Participating in PIRLS Literacy 2016

Note. Reprinted from Howie et al. (2017a, p. 48).

Figure 5.1 shows that South African learners achieved the lowest score of the participating countries; however, there is no statistical difference between South Africa and Egypt. The PIRLS Literacy 2016 achievement data were also scaled in such a way that the data could be placed on the PIRLS 2016 scale and compared to all the countries that participated in PIRLS 2016[34]. South African learners' achievement scores in comparison to the other participating countries in PIRLS 2016 are presented in Figure 5.2 (below).

[34] As discussed in Chapter 2, PIRLS Literacy originated from PIRLS and is an easier version of the reading literacy tests. See Section 2.3 for details.

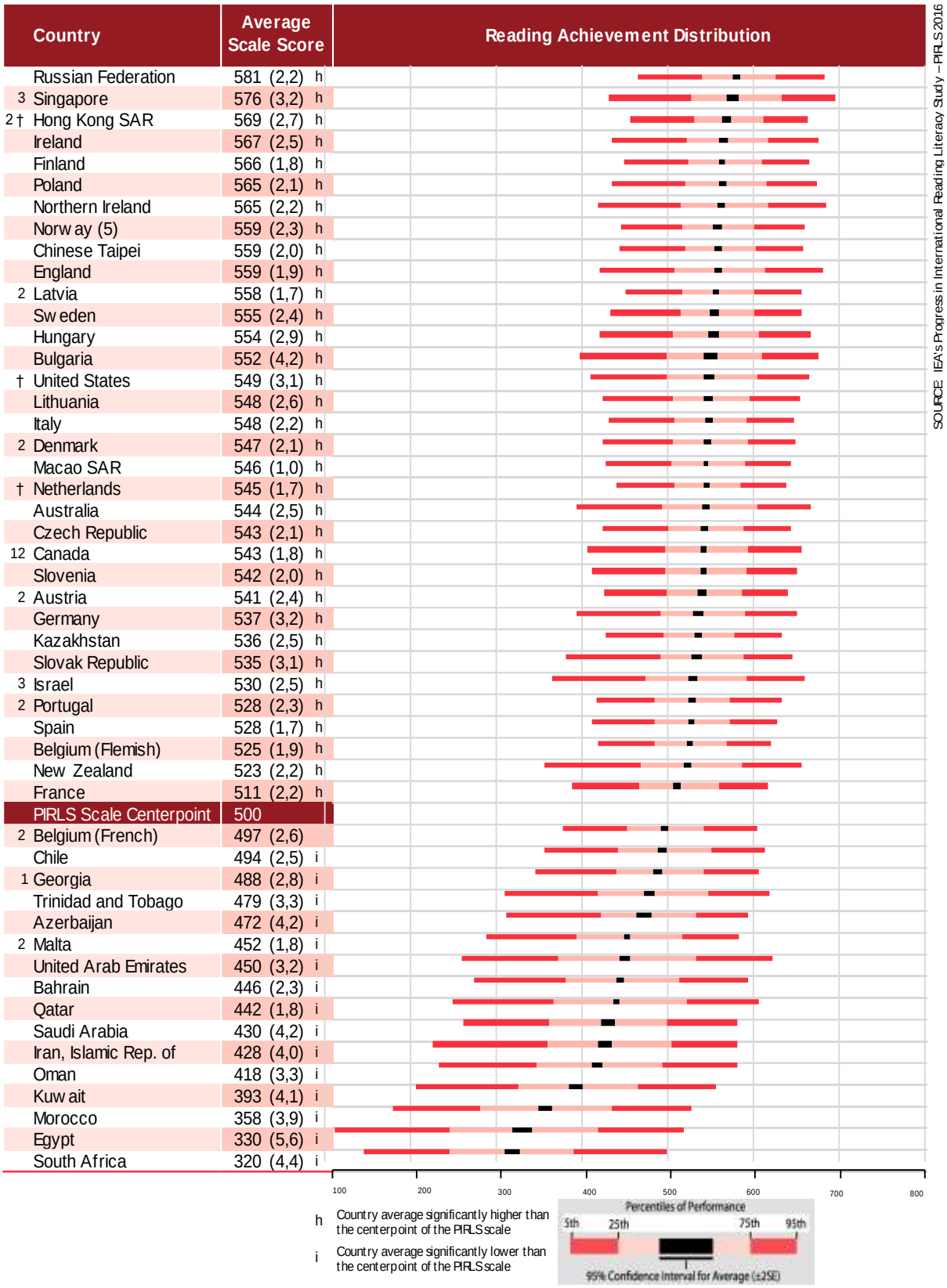

Figure 5.2: Distribution of International Reading Achievement

Note. Reprinted from Mullis et al. (2017).

Figure 5.2 emphasises South Africa's reading crisis as it reflects that South African Grade 4 learners achieved the lowest results of all the participating countries in PIRLS 2016. For this reason, the aim of the current study was to analyse teacher profiles and teachers' participation in formal and informal professional development activities as a means of establishing its association with the poor learner achievement reported in the PIRLS Literacy 2016 study, while controlling for the socio-economic status of the learners.

A total of 12 810 learners participated in the PIRLS Literacy 2016 South African study (Howie et al., 2017a). Results regarding teacher profiles and teachers' participation in professional development activities reflect the number of learners who were taught by those teachers who indicated the characteristics used for further analysis.

5.3 TEACHER PROFILES AND SOUTH AFRICAN GRADE 4 LEARNER ACHIEVEMENT

The professional background of teachers is very important for the development of successful reading literacy skills (Howie et al., 2017a). It is crucial for teachers to have the necessary knowledge of and skills in the language subjects that they teach (Martin & Mullis, 2015). The variables used for the current analysis were based on the teacher profiles selected for this study's conceptual framework. The descriptive analysis of the variables in the teacher questionnaire was guided by the components of the conceptual framework presented in Chapter 3.

Table 5.1: Teacher Profile Variables

Description	Variable	Source[35]
Age of the teacher	ATBG03	Teacher Questionnaire
Years of teaching experience	ATDG01	Teacher Questionnaire
Teachers' highest qualification	ATNG04B	Teacher Questionnaire

[35] See Appendix A for example questions on teacher profiles from the PIRLS Literacy 2016 teacher questionnaire.

The following sub-sections present the percentage of learners taught by teachers as described by the specific teacher profiles. The average reading literacy achievement of learners in conjunction with the specific teacher profiles are also presented.

5.3.1 AGE OF TEACHERS

Previous studies on teachers' age (Armstrong, 2015; Ismail et al., 2018) indicated that teachers' age can be associated with their effectiveness in the classroom. For the purpose of this study, teachers' age forms a part of teacher profiles as created from the PIRLS Literacy 2016 teacher questionnaire. Teachers were asked how old they were at the time of testing. Figure 5.3 presents the percentage of Grade 4 learners taught by teachers in the different age groups.

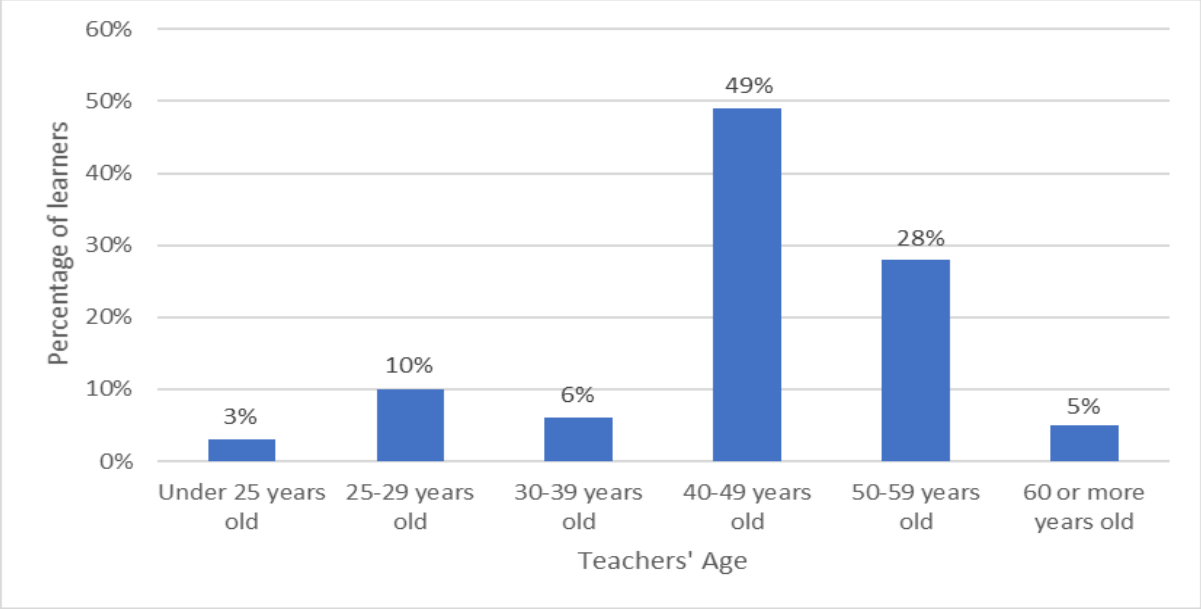

Figure 5.3: Percentage of Learners Taught by Teachers in Different Age Groups

Figure 5.3 reveals that three quarters of the South African Grade 4 learners who participated in the PIRLS Literacy 2016 study were taught by teachers in the age groups 40–49 years and 50–59 years. On average, South African teachers are older than their international peers (Howie et al., 2017a). These results are echoed by the literature which indicates that South African teachers are on average 43 years old (OECD, 2019). The ageing South African teaching force was already deemed a concern in the PIRLS 2011 study (Howie et al., 2017a). That concern is now even more emphasised because an aging teaching force will have to be replaced in the next

couple of years. This situation becomes even worse because more teachers are leaving than entering the profession (Armstrong, 2015; SACE, 2011).

Figure 5.4 indicates the average reading literacy achievement of South African Grade 4 learners in conjunction with teachers' age.

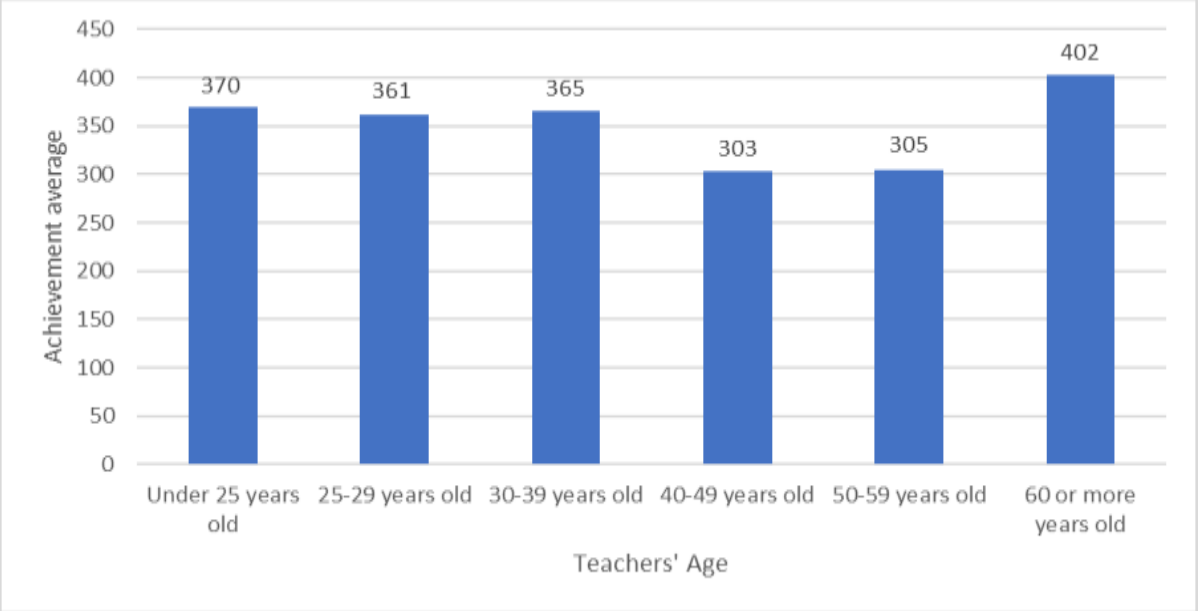

Figure 5.4: Average Achievement of Learners Taught by Teachers According to their Age Groups

Figure 5.4 shows that the achievement of learners taught by teachers in the age groups 40–49 years and 50–59 years was more than 60 points lower than the achievement of their peers taught by teachers in the other age groups, which indicates that learners taught by teachers in the age groups 40–49 years and 50–59 years are lagging one and a half years behind their South African peers[36]. This occurrence enhances the results presented in Figure 5.3 as it shows that most South African Grade 4 learners were taught by teachers in the 40–49 years and 50–59 years age groups, which makes their effectiveness in the classroom questionable. However, it is also evident that learners taught by teachers older than 60 years achieved significantly higher results than their peers taught by teachers in any of the other age groups. These

[36] 40 points = 1 year of formal schooling (Roux, 2015).

results are supported by previous cycles of PIRLS (Howie et al., 2008; Howie et al., 2012), which revealed that learners taught by teachers younger than 29 years and older than 60 years achieved the best results.

5.3.2 YEARS OF TEACHING EXPERIENCE

Years of teaching experience indicate the number of years that a teacher has been teaching[37]. The literature concerning teaching experience varies as different studies reflect different results. Some researchers suggest that teachers are more effective in their first few years of teaching (Burroughs et al., 2019; King Rice, 2010; Toropova, et al., 2019), whereas others found that more years of experience led to increased effectiveness in the classroom (Harris & Sass, 2010; Kosgei et al., 2013). Teachers were asked how many years (in total) they had been teaching at the time of testing. Figure 5.5 (below) shows the percentage of South African Grade 4 learners taught by teachers with various years of experience.

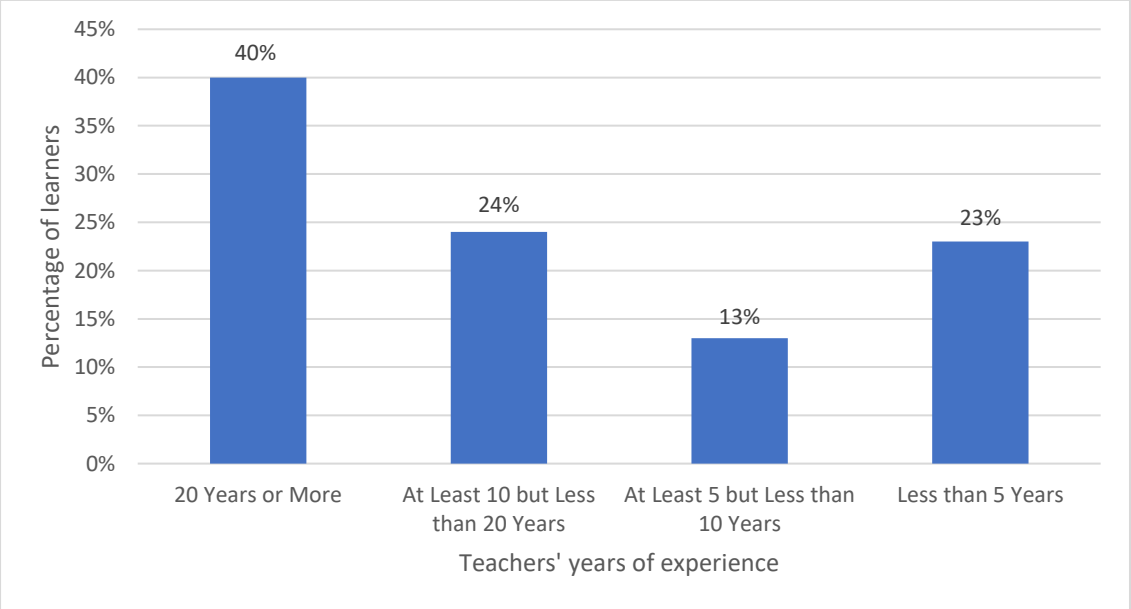

Figure 5.5: Percentage of Learners Taught by Teachers with Various Years of Experience

[37] Note. There is not necessarily a correlation between the age and experience of teachers because some teachers might have had a different occupation before starting to teach.

Figure 5.5 shows that 40% (SE = 4%) of learners were taught by teachers with 20 or more years of experience. This suggests that those teachers might be aged older than 40 years. Internationally, a similar pattern is visible since 42% of learners are taught by teachers who had 20 or more years of experience (Howie et al., 2017a). However, locally there seems to be fewer experienced teachers in the system; in 2016, the average number of years of experience was 15 years, while during the 2011 cycle of PIRLS the average number of years of teaching experience was 17 years (Howie et al., 2017a).

Figure 5.6 indicates the average achievement of South African Grade 4 learners taught by teachers with various years of experience.

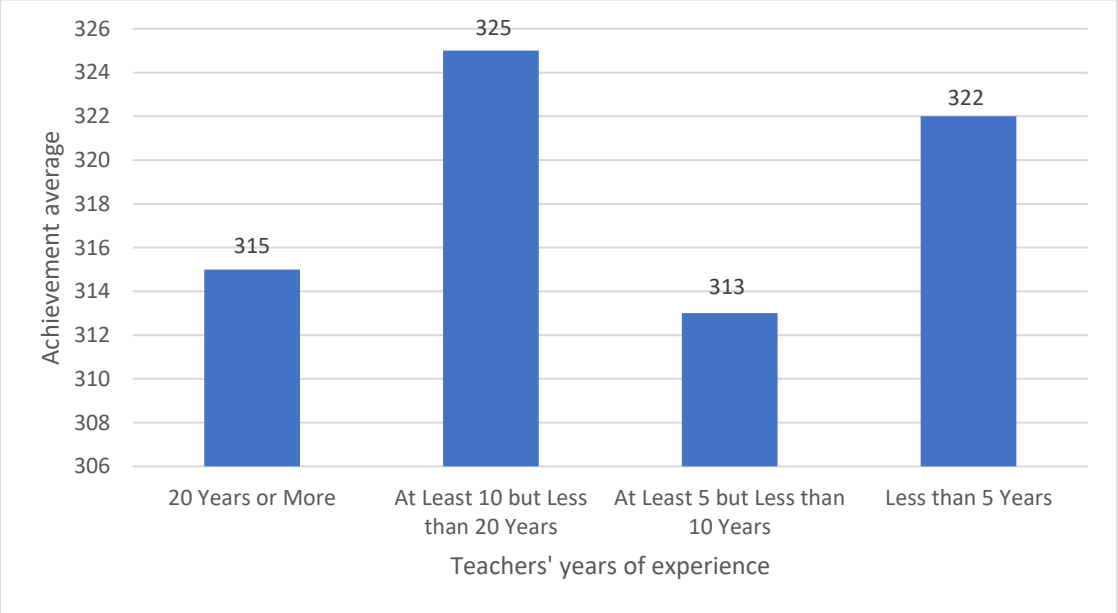

Figure 5.6: Average Achievement of Learners Taught by Teachers with Various Years of Experience

Figure 5.6 shows that learners taught by teachers with 20 or more years of experience achieved lower results than their peers taught by teachers with 10–20 years and less than 5 years' experience. These results support the literature that indicates that teachers become less effective over time.

Assuming that teachers with 20 or more years of experience are older than 40 years of age, one could conclude that teachers in the age groups 40–49 years and 50–59 years achieve lower results.

However, the PIRLS Literacy 2016 South African report notably mentions that globally, no statistically significant differences were found between learner achievement and teachers' experience (Howie et al., 2017a).

5.3.3 TEACHERS' HIGHEST LEVEL OF FORMAL QUALIFICATION

Although a formal qualification alone is not an indication of teachers' competency, teachers in South Africa are nevertheless appointed based on their academic qualifications. A qualification refers to the level of formal schooling completed by teachers. Teachers were asked what their highest formal qualifications were. The percentage of learners taught by teachers with different formal qualifications is depicted in Figure 5.7.

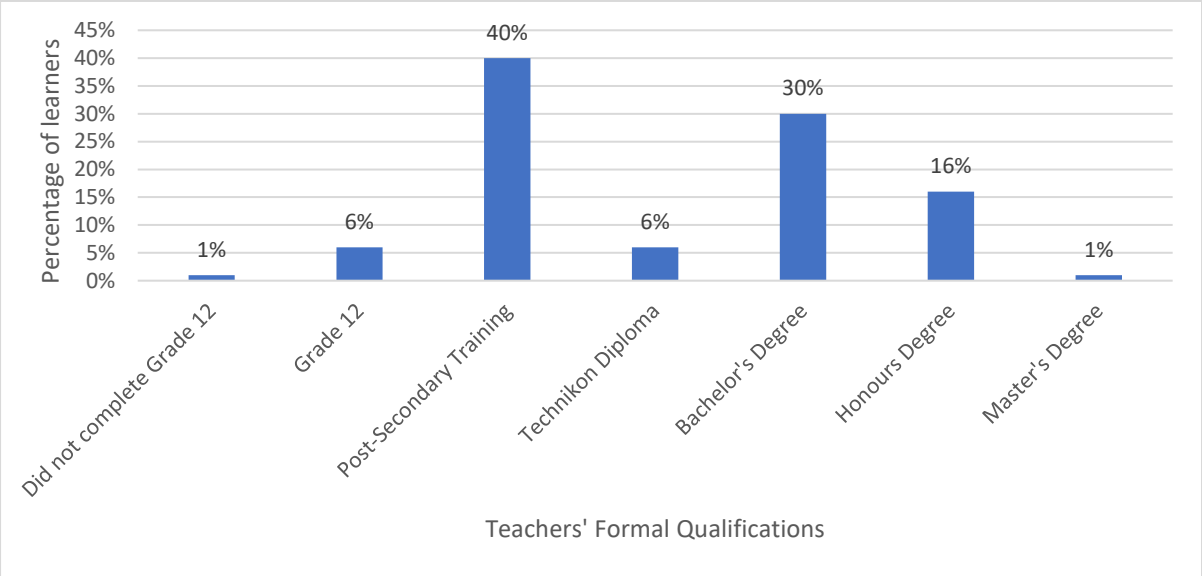

Figure 5.7: Percentage of Learners Taught by Teachers with Different Formal Qualifications

Figure 5.7 shows that the majority of learners were taught by teachers who completed post-secondary training, followed by teachers who obtained a bachelor's degree. Figure 5.7 also illustrates that almost half of the learners were taught by teachers who are not adequately qualified to teach. The minimum requirements for teaching are

either a four-year Bachelor's degree in Education or a three-year bachelor's degree with a Postgraduate Certificate in Education (DBE, 2019d). The results thus support the literature suggesting that many South African teachers are either unqualified or not sufficiently qualified (OECD, 2019; Savides, 2017).

Internationally, on the other hand, 60% of Grade 4 learners are taught by teachers who have completed a bachelor's degree with a further 26% of learners taught by teachers who have obtained a postgraduate degree (Howie et al., 2017a). Compared to South Africa, teachers from other countries are better and more adequately qualified to teach, which could explain their learners' higher reading literacy achievement results.

Figure 5.8 displays the average achievement of South African Grade 4 learners according to teachers' various levels of education.

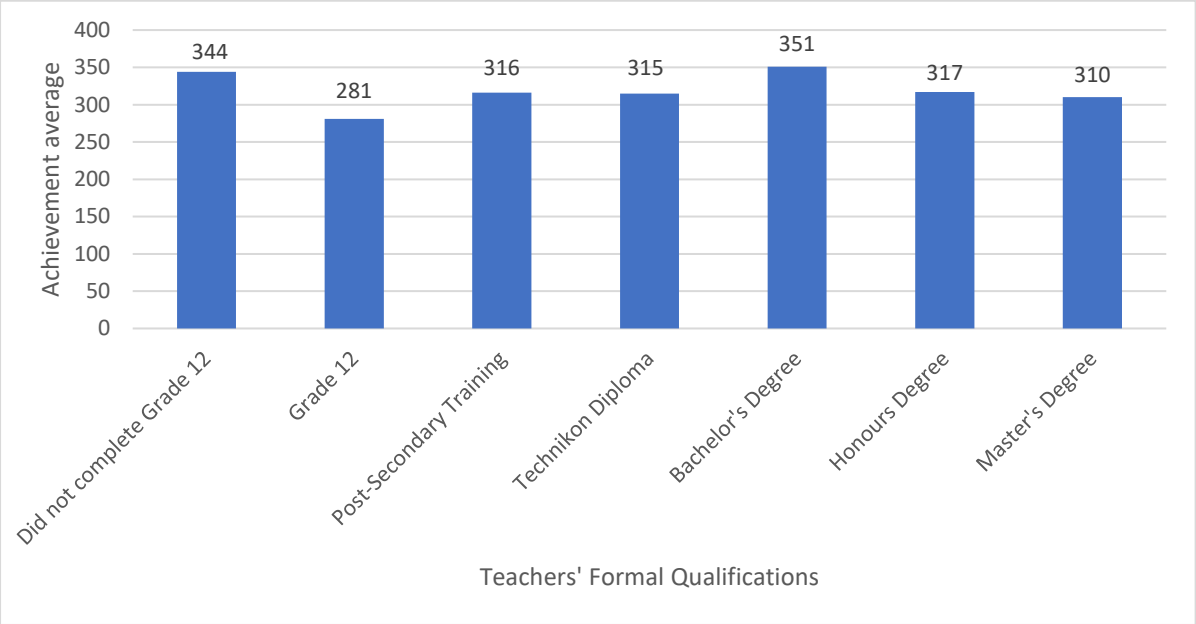

Figure 5.8: Average Achievement According to Teachers' Levels of Qualification

Figure 5.8 shows that there is a 36-point difference between the achievement scores of learners taught by teachers who hold a bachelor's degree (351, SE = 12) and those who only completed post-secondary training (316, SE = 7). These results suggest that learners taught by teachers with a bachelor's degree are almost a year ahead of learners taught by teachers with post-secondary training. It is, however, interesting to

note that there are learners taught by teachers who did not complete Grade 12, and these learners only scored 7 points lower than learners taught by teachers who hold a bachelor's degree. Furthermore, higher qualifications, such as honours or master's degrees, are not associated with more effective instruction, seeing that learners taught by teachers holding an honours or master's degree did not obtain better achievement results. It is therefore possible that higher teacher qualifications in South Africa do not lead to improved teaching practices.

5.4 PROFESSIONAL DEVELOPMENT AND SOUTH AFRICAN GRADE 4 LEARNER ACHIEVEMENT

Participation in professional development activities is supposed to promote teachers' subject and pedagogical knowledge and help them to become lifelong learners (All 4 Metamorph, 2016). Harris and Sass (as cited in Howie et al., 2017a) argue that learners in primary school learn more when their teachers engage in content-focused professional development. Professional development in this study is considered as both formal (Section 5.3.1) and informal professional development activities (Section 5.3.2). The descriptive statistics of formal and informal professional development and how these are linked to Grade 4 learners' reading literacy achievement are presented in the following sub-sections.

5.4.1 FORMAL PROFESSIONAL DEVELOPMENT

Teacher engagement in formal professional development activities could be associated with Grade 4 learners' reading literacy achievement. For the purpose of this study, formal professional development refers to teachers' participation in conferences, workshops, short courses and the attainment of formal qualifications[38]. Various researchers have examined the role of teachers in learner achievement (Chen & McCray, 2012; Desimone, 2009; Kang et al., 2013) and are of the opinion that effective professional development plays a crucial role in teachers' proficiency in teaching. For teachers to be able to effectively teach any subject, participation in formal professional development activities is very important. Table 5.2 summarises

[38] A further qualification (e.g. a postgraduate qualification) is seen by SACE as a form of obtaining CPTD points.

the variables used for the descriptive analysis of formal professional development activities.

Table 5.2: Formal Professional Development Variables

Description[39]	Variable	Source	Response options
Hours spent in seminars	ATBG06	Teacher Questionnaire	None Less than 6 hours 6–15 hours 16–35 hours More than 35 hours
Currently registered for a qualification	ATXG06B	Teacher Questionnaire	Yes No

Unfortunately, the PIRLS Literacy 2016 teacher questionnaire only addressed formal professional development activities in terms of seminars and whether teachers were registered for a qualification at the time of the survey. A seminar, as an activity, could include similar activities such as conferences, training or meeting for a specific discussion, presented in a formal academic setting (Lexico, 2020). The term *seminars*, could also include workshops, lesson studies and short courses. In the teacher questionnaire, teachers were asked: *In the past two years, how many hours in total have you spent on formal professional development (e.g. workshops, seminars, lesson studies, etc.) that dealt directly with reading or teaching reading (e.g. reading theory, instructional methods)?* Table 5.3 (below) displays the percentage of learners taught by teachers who have spent time attending seminars relating to teaching reading. Table 5.3 also shows learners' achievement related to the attendance of seminars.

[39] Appendix B includes questions from the PIRLS Literacy 2016 teacher questionnaire on formal professional development.

Table 5.3: Teachers' Attendance of Seminars

ATTENDANCE OF SEMINARS	N	%	SE	Average Achievement	SE
None	1169	9%	2%	326	21
Less than 6 hours	2560	24%	3%	323	9
6–15 hours	2741	25%	3%	315	14
16–35 hours	2227	20%	3%	328	11
More than 35 hours	2417	23%	3%	317	10

Considering the literature and the requirements set by the SACE, teachers should collect at least 150 CPTD points in a three-year cycle. If 5 points amount up to two hours of attendance (All 4 Metamorph, 2016), teachers should spend about 60 hours on professional development activities[40]. Table 5.3 reveals that more or less half of the participating learners were taught by teachers who spent less than 15 hours on attending seminars. However, it may be that some teachers have spent more hours in seminars that have nothing to do with teaching reading. The descriptive statistics are supported by the School Monitoring Survey of 2017, which reported that primary school teachers engaged in 36 hours of professional development on average (DBE, 2018a). "In South Africa, a higher percentage (43%) of teachers spent 16 hours or more on professional development" (Howie et al., 2017a, p. 125), while only 36% of learners internationally were taught by teachers who spent 16 hours or more on formal professional development activities (Howie et al., 2017a).

[40] Note that the 60 hours could include informal professional development activities (e.g. attending various meetings) as well.

Table 5.3 also shows that the average achievement of learners stayed more or less consistent, regardless of the number of hours their teachers spent on attending seminars related to teaching reading. This occurrence is echoed internationally as there seems to be no discernible relationship between the amount of time spent on formal professional development and learners' reading literacy achievement (Howie et al., 2017a). It could be possible that teachers only engage in these types of activities because it is required of them, but they do not internalise the newly acquired information or apply it to their teaching in the classroom. The response pattern could also be an indication of the Dunning-Kruger effect[41]. It may also be that teachers provided socially-desirable answers when completing the teacher questionnaire because they wanted it to appear as though they attend professional development.

The second aspect of formal professional development dealt with in the PIRLS Literacy 2016 teacher questionnaire is whether teachers were registered for a qualification related to their area of specialisation at the time of testing. Teachers were asked: *Are you currently registered for a qualification which is related to your area of specialisation?* The results in terms of the percentage of learners taught by teachers who were or were not registered for a relevant qualification, as well as learners' average achievement are reflected in Table 5.4.

[41] The Dunning-Kruger effect explains that teachers can not accurately assess their performance of a task (Kruger & Dunning, 1999).

Table 5.4: Teachers Registered for a Qualification

REGISTERED FOR A QUALIFICATION	N	%	SE	Average Achievement	SE
Yes	3774	32%	4%	339	11
No	7349	68%	4%	314	5

Table 5.4 shows that almost 68% (SE = 4%) of learners are taught by teachers who are not currently registered for a qualification related to their area of specialisation. The possibility exists that few teachers have the means and/or motivation to better their qualification in terms of their area of specialisation. However, it is possible that some teachers originally specialised in a different occupational field before becoming teachers. It is also evident from Table 5.4 that learners taught by teachers who are currently registered for a qualification are about six months ahead (25-point difference) of their peers whose teachers have not improved their qualifications.

5.4.2 INFORMAL PROFESSIONAL DEVELOPMENT

For the purpose of this study, informal professional development refers to:

- teachers' collaboration with other teachers
- sharing of experiences
- observing other teachers
- discussions
- cluster meetings
- PLC meetings
- sharing of informational material.

As emphasised by the Department of Basic Education (2014), teaching is context-related and it should be a collaborative effort. Professional development may therefore be considered two-sided because participation in informal professional development activities may be equally important to formal professional development activities. The

variables used for the analysis of the descriptive statistics with regard to informal professional development are listed in Table 5.5.

Table 5.5: Informal Professional Development Variables

Description	Variable	Source	Response options
Collaboration between school leadership and teachers to plan instruction	ATBG07E	Teacher Questionnaire	Very high High Medium Low Very low
Share teaching experiences	ATBG09A	Teacher Questionnaire	Very often Often Sometimes Never or almost never
Observe other teachers to learn more	ATBG09B	Teacher Questionnaire	Very often Often Sometimes Never or almost never
Work together to improve how to teach a topic	ATBG09C	Teacher Questionnaire	Very often Often Sometimes Never or almost never
Work with teachers from other schools on the curriculum	ATBG09D	Teacher Questionnaire	Very often Often Sometimes Never or almost never
Work with teachers from other grades to ensure continuity in learning	ATBG09E	Teacher Questionnaire	Very often Often Sometimes

Description	Variable	Source	Response options
			Never or almost never
Set goals and monitor achievement	ATBG09F	Teacher Questionnaire	Very often Often Sometimes Never or almost never
Share informational materials	ATBG09G	Teacher Questionnaire	Very often Often Sometimes Never or almost never
Attend cluster meetings	ATBG09H	Teacher Questionnaire	Very often Often Sometimes Never or almost never

Although not specifically labelled as informal professional development, the PIRLS Literacy 2016 teacher questionnaire included various variables related to professional development activities that take place in informal settings, which are similar to the professional development activities suggested by SACE[42] and expected by the DBE. The descriptive analysis of these variables is presented in the next few sub-sections.

5.4.2.1 Collaboration Between School Leadership and Teachers to Plan Instruction

Researchers suggest that current school administrators and teachers are more interested in collaborating than previous generations (Arkansas State University, 2017; Harper, 2018). Previous studies conducted in America found that effective collaboration and a high level of trust between school leadership and teachers led to

[42] See Section 3.7.1 and 3.7.2 for an explanation of the informal professional development engagements suggested by SACE and the DBE.

improved test scores of learners (Anrig, 2015). In the teacher questionnaires, teachers were asked to characterise the collaboration between school leadership and teachers on a scale ranging from very low to very high. Table 5.6 exhibits the percentage of teachers who collaborated with school leadership about instruction compared to learners' average achievement.

Table 5.6: Collaboration Between School Leadership and Teachers

COLLABORATION WITH LEADERSHIP TO PLAN INSTRUCTION	N	%	SE	Average Achievement	SE
Very high	**3438**	33%	4%	324	9
High	**5188**	45%	4%	318	9
Medium	**1946**	19%	3%	317	11
Low	**245**	2%	1%	342	14
Very low	**97**	1%	1%	286	55

Table 5.6 shows that the majority of teachers indicated that they collaborate with school leadership about instruction. What is interesting, is that learners taught by teachers who indicated low collaboration between school leadership and teachers, scored 18 more points than those taught by teachers who reported very high collaboration. A possible reason for this response could be that the teachers who do not engage in frequent collaboration are more experienced in teaching reading and their own methods work better than those suggested by school leadership. It is also possible that in some schools there are no collaboration between school management and teachers and therefore teachers have to manage on their own. This idea is supported by the literature noting that some teachers feel that they are not monitored and supported when it concerns their participation in professional development activities (Bernadine, 2018; Nel et al., 2016).

5.4.2.2 Sharing Experiences

Teaching, as previously mentioned, should be a collaborative effort between all stakeholders in the education system. Such effort requires teachers to share what they have learned through their teaching experiences so that others can learn from them to improve their own teaching practices. Teachers were asked how often they share what they have learned through their teaching experiences. Table 5.7 reflects the results.

Table 5.7: Teachers who Share Experiences

TEACHERS SHARE LEARNING	N	%	SE	Average Achievement	SE
Very often	5403	44%	3%	332	6
Often	3931	37%	3%	309	7
Sometimes	1773	17%	3%	310	16
Never or almost never	170	2%	1%	339	18

It is clear from Table 5.7 that most learners are taught by teachers who regularly engage in situations where they share their teaching experiences. Although teachers who selected *often* or *sometimes* as options tell a different story. Learners taught by teachers who never share their experiences with other teachers performed the best. Arguably, this could be because those teachers are not influenced by their colleagues and they do not attempt to use teaching strategies that they know would not work for them. Those teachers possibly stick to what they know works for them. Learners' achievement scores make the effectiveness of teachers' experiences of what works for them doubtful because few strategies seem to be successful in improving learners' reading performance.

5.4.2.3 Observing Other Teachers

Observing other teachers is yet another strategy that could be utilised by teachers to adopt new strategies to teach reading effectively. Education World (2020) mentions that observation is usually linked to classroom performance, but more and more schools are starting to implement it as a form of professional development. Observing other teachers refers to the practice of attending a colleague's class to observe the way that they teach. In this way teachers can learn different strategies from others, which they could later use in their own classrooms. Teachers were asked how often they observe another classroom to learn more about teaching. Table 5.8 presents the results.

Table 5.8: Teachers Observing Other Teachers

OBSERVING OTHER TEACHERS	N	%	SE	Average Achievement	SE
Very often	3340	27%	3%	314	4
Often	3778	36%	4%	306	7
Sometimes	3544	33%	3%	341	11
Never or almost never	594	4%	1%	323	12

Table 5.8 shows that most learners are taught by teachers who often observe other classes. A third of the learners are, however, taught by teachers who only sometimes observe other classes, yet this group of learners obtained the best achievement results. Their achievement is almost 20 points better than that of their peers. It is further interesting to note that teachers who only sometimes observe other teachers obtained better results than those who often observe other teachers. The reason for this could be that those teachers only observe other teachers some of the times since most of the times they do what works best for them. Furthermore, teachers who often observe other teachers may lack confidence in their own teaching methods. Styles

and approaches to teaching differ and teachers should make the best of their natural strengths (Liesveld & Miller, 2005).

5.4.2.4 Working with Other Teachers

Teachers can learn from one another and enhance their teaching by working together to determine effective ways to teach a particular topic. The goal of professional learning communities (PLCs) is reinforced by this idea since the DBE wants teachers who are more knowledgeable about a certain topic to share their strategies so that other teachers can learn from them. Those who acquired new knowledge can then pass it on to others at a different meeting. The results to the question: *How often do you interact with other teachers to teach a particular topic?* are presented in Table 5.9.

Table 5.9: Teachers who Work Together

TEACHERS WORK TOGETHER ON A TOPIC	N	%	SE	Average Achievement	SE
Very often	4829	40%	4%	316	6
Often	4076	38%	4%	306	8
Sometimes	2118	21%	3%	354	12
Never or almost never	174	1%	1%	324	28

Table 5.9 reveals that 78% (SE = 4) of learners were taught by teachers who often or very often work with other teachers on a particular topic. A fifth of the learners were taught by teachers who work with other teachers only some of the times, yet, learners taught by those teachers outperformed their peers. These results could be linked to similar results relating to observation. Teachers assumedly trust their own teaching methods and only work with other teachers when they think that they can benefit from more information about a specific topic.

5.4.2.5 Working with Teachers from Other Schools

It may be beneficial for teachers from different schools to work together on the curriculum as teachers can help one another to enhance their understanding of certain topics and expectations. Working with teachers from other schools is also related to the idea of PLCs and learning from other teachers. Teachers were asked how often they work with teachers from other schools on the curriculum. Table 5.10 reflects the results.

Table 5.10: Teachers Working with Teachers from Other Schools

WORK TOGETHER ON THE CURRICULUM	N	%	SE	Average Achievement	SE
Very often	2643	23%	3%	303	7
Often	3514	28%	3%	314	9
Sometimes	4141	40%	4%	318	9
Never or almost never	899	9%	2%	394	18

Based on Table 5.10, it is troublesome to note that although there were only a few learners who were taught by teachers who never work with teachers from other schools, those learners achieved the highest achievement scores. There is a 90-point difference between the achievement of learners taught by teachers who never work with teachers from other schools and those who do that very often. This means that learners who are taught by teachers who do not work with teachers from other schools are more than two years ahead of their peers. This situation raises the question whether collaboration between different schools and PLC meetings are as effective as the DBE expects it to be. It is also possible that the collaboration between teachers from different schools is ineffective because the contexts of the schools differ and therefore the challenges faced by the various schools may also differ. The necessity for a teacher to be knowledgeable about both the curriculum and teaching reading is

also supported by this occurrence. Teachers who rely on their own knowledge are arguably more effective than those who rely on the knowledge of other teachers.

5.4.2.6 Working with Teachers from Other Grades to Ensure Continuity in Learning

In South Africa, teachers adhere to the Curriculum and Assessment Policy Statement (CAPS). Every consecutive year they strengthen and build on the concepts taught in languages. The concepts in the Intermediate Phase build on the concepts taught in the Foundation Phase. These concepts are elaborated on in higher grades (DBE, 2011). The necessity of vertical alignment between grades arises. Teachers of a specific grade can plan, teach and accommodate learners' needs more effectively if they know what knowledge learners in previous grades have already acquired and which concepts they still find challenging. The PIRLS Literacy 2016 teacher questionnaire asked teachers how often they worked with teachers from other grades to ensure continuity in learning. Table 5.11 reflects the results.

Table 5.11: Teachers Working with Teachers from Other Grades

ENSURING CONTINUITY IN LEARNING	N	%	SE	Average Achievement	SE
Very often	3913	33%	3%	318	7
Often	4651	43%	4%	315	9
Sometimes	2160	21%	3%	327	11
Never or almost never	419	4%	1%	362	24

The results in Table 5.11 are similar to the results of Table 5.10; only a few learners were taught by teachers who never worked with teachers from other grades to ensure continuity in learning. Likewise, learners taught by these teachers correspondingly attained the highest achievement results, putting them more or less a year ahead of their peers. The results of Table 5.11 could also imply that not all teachers regard it necessary to work with teachers from other grades because most language concepts are repeated elsewhere in the curriculum. The analysis also strengthens the importance that teachers require knowledge about the curriculum, specifically for the subject and grade that they teach. Teachers should have a good knowledge of the

content that they are expected to teach. All information a teacher is required to know is provided in the relevant policy documents.

5.4.2.7 Setting Goals and Monitoring Achievement

Research on the importance for educators to set goals and monitor achievement has shown that more focus should be on teachers' goals (Camp, 2017). Research indicated that teachers' goals may be related to their instructional effectiveness and professional growth (Camp, 2017). Teachers were asked how often they set goals and monitor their achievement of these goals. The percentage of teachers who set goals and monitored achievement, in relation to learners' achievement, is presented in Table 5.12.

Table 5.12: Teachers who Set Goals and Monitor Achievement

SET GOALS AND MONITOR ACHIEVEMENT	N	%	SE	Average Achievement	SE
Very often	4847	39%	3%	323	7
Often	4977	45%	3%	320	6
Sometimes	1322	15%	3%	315	17
Never or almost never	53	0%	0%	279	19

Table 5.12, contradictory to the other variables related to informal professional development, indicates a positive association between teachers who set goals and monitor achievement and learner achievement. Only a small difference between *often* and *sometimes* is evident. The majority of learners were taught by teachers who set goals and monitor achievement, and it was also these learners who achieved the highest scores. South African learners' achievement results may, however, be an indication that teachers need to alter their goals to better accommodate the difficulties faced by the education system.

5.4.2.8 Sharing Informational Material

Similar to working with teachers from other schools and other grades, the sharing of informational material can also be associated with PLCs, since teachers can share informational material that they created or found to teach a particular topic with other teachers, hoping that it would also improve the other teachers' teaching experiences. Teachers had to respond to how often they share informational material. Table 5.13 displays the results.

Table 5.13: Teachers who Share Informational Material

TEACHERS WHO SHARE INFORMATIONAL MATERIAL	N	%	SE	Average Achievement	SE
Very often	4740	41%	4%	328	7
Often	4912	45%	3%	311	6
Sometimes	1407	14%	3%	326	20
Never or almost never	138	1%	1%	325	43

From Table 5.13, it is evident that although a great number of learners were taught by teachers who share informational materials, the sharing did not really improve learners' achievement because there is only a small difference between the achievement of the learners who were taught by teachers who shared informational materials very often and those who only shared informational material sometimes, never or almost never. It could be possible that teachers only indicated that they share informational material because the DBE expects them to do so. It could also be possible that, because of contextual factors and a lack of resources, there may be little noteworthy informational material to share that could enhance the learning experience. However, reading resources in the 11 official languages can also be accessed online.

5.4.2.9 Attending Cluster Meetings

Initially, various provincial education departments used cluster meetings as a vehicle for professional development (Jita & Mokhele, 2012). Currently, subject teachers are compelled to attend subject meetings organised by facilitators from the different provincial education departments. It is used as a mechanism to communicate departmental and district expectations to subject teachers. It is also used to present subject-related professional development topics. As part of informal professional development, teachers were asked how often they attend cluster meetings. Table 5.14 presents the results.

Table 5.14: Teachers who Attend Cluster Meetings

Attend Cluster Meetings	N	%	SE	Average Achievement	SE
Very often	5803	45%	4%	322	6
Often	3318	33%	4%	321	11
Sometimes	1813	18%	3%	313	9
Never or almost never	310	3%	1%	320	18

The majority of the learners were taught by teachers who often or very often attended cluster meetings. Regardless of whether teachers attended cluster meetings or not, it did not make a prominent difference in learners' reading literacy achievement. Although the DBE has implemented various programmes and policies in an attempt to address the reading crisis in South Africa, the attempts have not improved learner achievement. Provincial facilitators may not be as efficient as the department would hope in presenting and communicating departmental expectations to subject teachers and in motivating teachers. The possibility also exists that, in some cases, teachers only attend cluster meetings because it affords them an opportunity to spend time outside the classroom.

The following sub-section presents the descriptive statistics for the socio-economic status of the learners.

5.5 SOCIO-ECONOMIC STATUS OF LEARNERS

Since this study controls for the socio-economic status of the learners, the descriptive statistics for the socio-economic status of learners are also presented. As mentioned in the literature, various inequalities in the education system still exist (Spaull, 2019). Most South African schools suffer financial difficulties (DBE, 2011a) and learners from wealthier families tend to achieve better results than their disadvantaged peers (Spaull, 2019). Figure 5.9 presents the percentage of learners who come from economically disadvantaged backgrounds. The variable, whether learners came from disadvantaged backgrounds, were selected for the descriptive analysis as the standard error for the affluent backgrounds was high (Mean = 360; SE = 31).

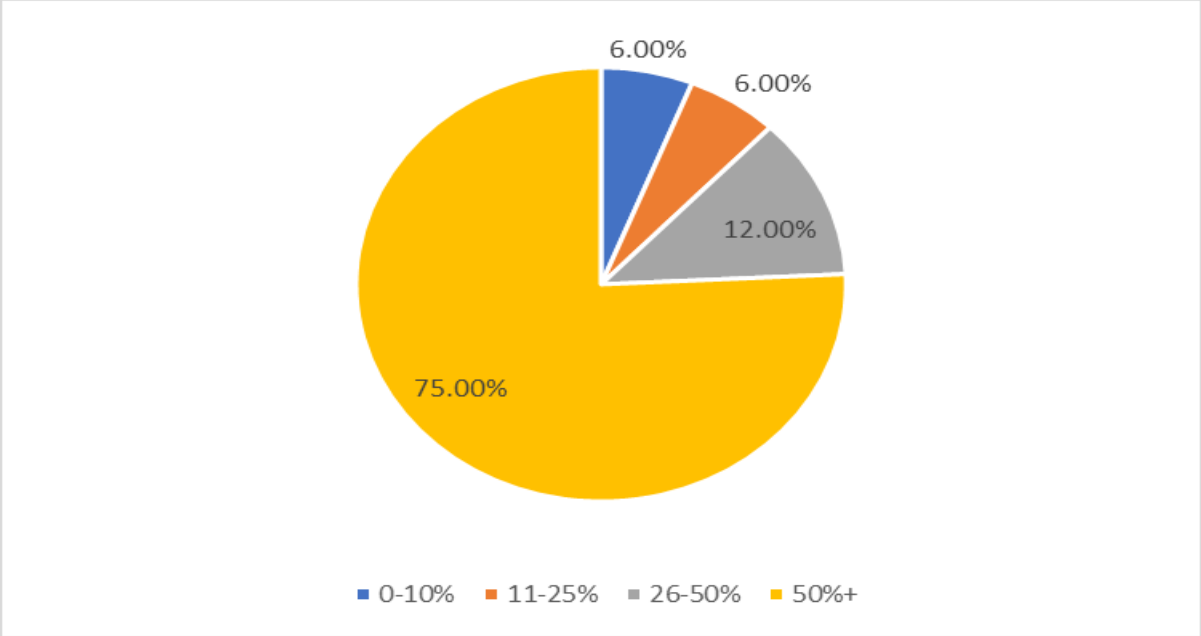

Figure 5.9: Percentage of Learners from Disadvantaged Backgrounds

School principals were asked what percentage of learners who attend their schools came from economically disadvantaged backgrounds. Figure 5.9 reveals that 75% of learners attend schools in which more than 50% of the learners come from economically disadvantaged backgrounds.

Figure 5.10 illustrates the average achievement of learners according to their socio-economic backgrounds. The data were provided by the school principals.

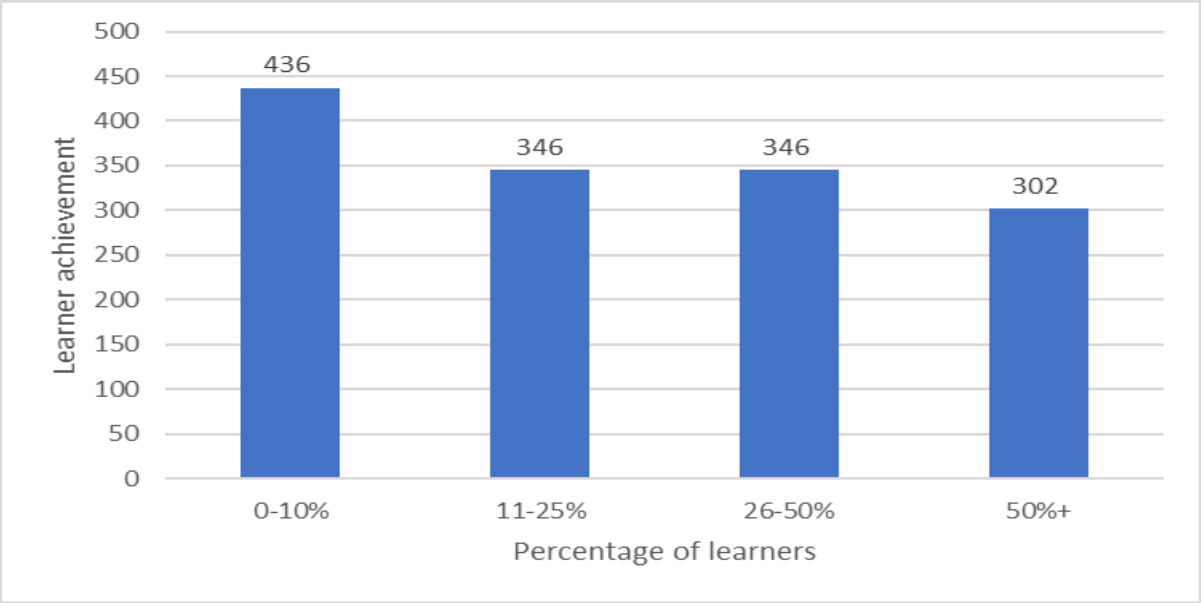

Figure 5.10: Learner Achievement and Learners from Disadvantaged Backgrounds

It is evident from Figure 5.10 that the achievement results of learners who come from disadvantaged backgrounds are lower than that of their peers from affluent homes. Figure 5.10 indicates that there would be a 134-point difference between the achievement of learners when 50% or more learners come from disadvantaged backgrounds and only 10% or less when learners come from economically disadvantaged backgrounds. Learners from schools where 50% or more learners come from economically disadvantaged backgrounds are accordingly more than three years behind their economically affluent peers.

The poor reading literacy achievement of learners from economically disadvantaged backgrounds could be attributed to a lack of resources in the schools that they attend, or poor-quality education provided in rural areas. Moreover, learners from economically disadvantaged homes may not have access to educational resources or support at home, which could lead them to fall behind.

5.6 CONCLUSION

Chapter 5 provided a detailed discussion of the descriptive results for the variables related to the conceptual framework. The descriptive results attempted to answer the research questions by exploring the relationship between (a) teacher profiles and South African Grade 4 learners' reading literacy achievement, as well as (b) the association between teachers' participation in formal and informal professional development and South African Grade 4 learners' reading literacy achievement. Teacher profiles were discussed in terms of teachers' age, years of experience and formal qualifications. Formal professional development was described in terms of hours spent in seminars (including workshops and short courses) and whether teachers were registered for a further qualification related to their area of specialisation at the time of testing. Informal professional development was explored in terms of collaboration between school leadership and teachers to plan instruction, teachers sharing learning experiences, observing other teachers and working with other teachers on a particular topic. The exploration of informal professional development also included: working with teachers from other schools on the curriculum, working with teachers from other grades to ensure continuity in learning, sharing informational material and attending cluster meetings.

In terms of teacher profiles, the results of the analysis revealed that most learners were taught by teachers in the age group 40–59 years, but this group of teachers seems to be the least effective at teaching reading as the learners taught by them achieved the lowest reading literacy results. A large percentage of learners were also taught by teachers with 20 or more years of experience. Internationally, no significant relationship between teachers' years of experience and learner achievement seems to exist. Quite a number of South African teachers seem not to be adequately qualified to teach and the majority of learners are taught by teachers who only completed post-secondary education, compared to most learners internationally being taught by teachers holding a bachelor's or postgraduate degree.

With regard to formal professional development, South African teachers attend more hours of formal professional development than their international peers. The effectiveness of the professional development activities is, however, questionable as

it did not lead to improved learner performance. Additionally, only about a third of South African teachers are currently registered for a qualification related to their area of specialisation.

Concerning all the possible aspects of informal professional development used in the analysis, most learners were taught by teachers who engaged in informal professional development activities quite regularly. With the exception of setting goals and monitoring achievement, the participation in informal professional development activities by teachers did not lead to improved learner performance. In some cases, learners taught by teachers who did not participate in informal professional development activities on a regular basis performed better than their peers taught by teachers who regularly participated in these activities.

The descriptive statistics relating to the socio-economic status of learners revealed that about three quarters of schools indicated that more than 50% of the learners attending their schools came from economically disadvantaged backgrounds. Furthermore, with more than 50% of learners in schools coming from economically disadvantaged backgrounds, learner achievement is accordingly negatively affected.

In conclusion, South African teachers' participation in formal and informal professional development activities are not leading to better achievement results in learners. The possibility exists that the measurement of these variables could have been limited as the teacher questionnaire was not comprehensive enough in its questioning of professional development. Furthermore, perhaps the occurrences can also be ascribed to the ineffectiveness and poor-quality professional development opportunities presented to South African teachers. Teachers' willingness and motivation (or a lack thereof) to participate and to apply the knowledge they have acquired to their teaching practice could arguably also be a reason why teachers' engagement in professional development is not positively related to learners' reading literacy achievement.

CHAPTER 6
FACTORS PREDICTING LEARNER ACHIEVEMENT

6.1 INTRODUCTION

This study aimed to investigate the possible relationship between South African Grade 4 learners' reading literacy achievement, teacher profiles (in terms of teachers' age, years of experience and formal qualifications), and teachers' participation in formal and informal professional development activities when controlling for the socio-economic status of the learners. The inferential findings based on the selected variables for the descriptive analysis process[43] are presented in this chapter. This chapter reports on the research questions investigating (a) teacher profiles in terms of teachers' age, years of experience and formal qualifications, (b) teachers' participation in formal and informal professional development activities and (c) the association it may have with Grade 4 learners' reading literacy performance. The items used were selected from the PIRLS Literacy 2016 teacher and school questionnaires.

The main research question of this study was: *What is the relationship between teacher profiles, teachers' participation in formal and informal professional development and Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners?*

Participating countries in the PIRLS studies use the International Database (IDB) Analyzer because it was specifically created to consider the complex procedures and sample weights used in the different IEA studies (Howie et al., 2017a). Since the current study is a secondary analysis of the PIRLS Literacy 2016 data, it was important to use the IDB Analyzer for the descriptive analysis as well as the standard multiple regression analysis. SPSS software was used for the reliability analysis.

Section 6.2 presents the reliability analysis before the principal component analysis is presented in Section 6.3. In Section 6.4, multiple regression analysis was used to

[43] See Chapter 5 for details.

analyse teacher profiles in terms of teachers' age, years of experience and formal qualifications, teachers' participation in formal and informal professional development and the socio-economic status of the learners. Section 6.5, which draws from the study's results, concludes this chapter and provides the foundation for Chapter 7.

6.2 RELIABILITY RESULTS

Reliability analysis was conducted to determine which variables in the PIRLS Literacy 2016 teacher questionnaire should be set aside for further analysis. Reliability refers to whether or not a measure consistently reflects the construct that it is measuring (Field, 2018). In other words, reliability refers to the dependability and consistency of an assessment's results (Gareis & Grant, 2015). Using SPSS, the Cronbach's Alpha (α) was computed to ascertain the reliability of the selected variables for further analysis.

Various researchers suggest that a value between 0.7 to 0.8 is an acceptable value for Cronbach's Alpha (α) and that considerably lower values become unreliable (Field, 2018). However, in some cases values below 0.7 can be realistic because of the diversity of the constructs (Field, 2018). Field (2018) further explains that higher α values may occur when the number of items in the scale increases and lower α values may be present when there are fewer items in the scale. Thus, a Cronbach's Alpha (α) value of 0.5 may also generally be accepted (Field, 2018). During the reliability analysis it was necessary to recode the items in order to measure items in the same direction.

In Section 6.4.1 the reliability of items selected for formal professional development is discussed, followed by a discussion in Section 6.4.2 of informal professional development items.

6.2.1 RELIABILITY OF FORMAL PROFESSIONAL DEVELOPMENT VARIABLES

Items selected for the reliability of items relating to formal professional development, as described in the conceptual framework (see Section 3.9.2), included the attendance of seminars (which also include workshops, conferences and lesson studies) and whether or not teachers are currently registered for a qualification related to their area

of specialisation. Table 6.1 depicts these variables and corresponding reliability scores.

Table 6.1: Reliability Coefficients for Formal Professional Development

Variable Description	Cronbach's Alpha (α)
Hours spent in seminars	0.42
Currently registered for a qualification related to area of specialisation	0.34
Total reliability for formal professional development	0.012

For *Hours spent in seminars,* teachers were expected to indicate the number of hours they spent attending seminars (workshops, conferences and lesson studies). For *Currently registered for a qualification,* teachers were asked whether they were currently registered for a qualification related to their area of specialisation. Both items scored a coefficient below 0.5, which makes the items seemingly unreliable to use in further analysis. The low reliability scores could be explained by the fact that not all teachers responded correctly to the items, which resulted in invalid data. It was necessary to exclude a considerable amount of the participating teachers' response data. The reason for the low reliability could also be that only two items were present in each scale. McMillan and Schumacher (2001), however, point out that reliability coefficients below 0.5 may be acceptable when decisions are made about a group rather than an individual. Although the reliability scores for formal professional development seem low, it is based on responses of teachers of 12 810 learners. The coefficients may therefore be acceptable since inferences will be drawn about a large sample.

6.2.2 RELIABILITY OF INFORMAL PROFESSIONAL DEVELOPMENT VARIABLES

The reliability of informal professional development was tested by running Cronbach's Alpha (α) on the following items related to informal professional development:

- Collaboration between school leadership and teachers to plan instruction
- Sharing of teaching experiences
- Observing other teachers
- Working together to teach a particular topic
- Working with teachers from other schools on the curriculum
- Working with teachers from other grades to ensure continuity in learning
- Setting goals and monitoring achievement
- Sharing informational material
- Attending cluster meetings.

The items above are found in the PIRLS Literacy 2016 teacher questionnaire and also relate to this study's conceptual framework (see Section 3.9.2). Table 6.2 presents the abovementioned variables and their corresponding reliability scores.

Table 6.2: Reliability Coefficients for Informal Professional Development

Variable Description	Cronbach's Alpha (α)
Collaboration to plan instruction	0.79
Sharing of teaching experiences	0.83
Observing other teachers	0.62
Working together on a particular topic	0.79
Working with teachers from other schools on the curriculum	0.55
Working with teachers from other grades to ensure continuity in learning	0.77
Setting goals and monitoring achievement	0.88

Variable Description	Cronbach's Alpha (α)
Sharing informational materials	0.86
Attending cluster meetings	0.82
Total reliability of informal professional development	0.80

The overall reliability coefficient for the nine items relating to informal professional development was 0.80, even though a large percentage of the teachers' responses were excluded. In this case teachers refer to teachers of participating learners. It is also evident that most of the items related to informal professional development are reliable because all of them adhere to the generally accepted value of 0.5 (Field, 2018). However, the possibility exists that teachers misunderstood or misreported on the questions about observing other teachers and working with teachers from other schools on the curriculum because the reliability coefficients of these two items are significantly lower than that of the other items.

The overall reliability coefficient for all items relating to formal and informal professional development is presented in Table 6.3.

Table 6.3: Reliability Coefficients Combined

Variable Description	Cronbach's Alpha (α)
Hours spent in seminars	0.40
Currently registered for a qualification related to area of specialisation	0.34
Collaboration to plan instruction	0.79
Sharing of teaching experiences	0.84
Observing other teachers	0.63
Working together on a particular topic	0.80

Variable Description	Cronbach's Alpha (α)
Working with teachers from other schools on the curriculum	0.55
Working with teachers from other grades to ensure continuity in learning	0.78
Setting goals and monitoring achievement	0.88
Sharing informational materials	0.87
Attending cluster meetings	0.82
Total reliability	0.71

Notably, when the 11 formal and informal professional development items are combined in the reliability analysis, a Cronbach's Alpha (α) score of 0.71 is obtained, resulting in an acceptable reliability score. Since the general reliability score is acceptable, all of the items were used for further analysis in the multiple regression model.

6.3 PRINCIPAL COMPONENT ANALYSIS

After the reliability of the formal and informal professional development was established, a principal component analysis (PCA) was conducted "to reduce the data set to a more manageable size while retaining as much of the original information as possible" (Field, 2018, p. 779). The purpose of the principal component analysis was to establish the maximum common variance of the factor loadings. The principal component analysis was further used to overcome multicollinearity in the multiple regression analysis as the variables responsible for multicollinearity combine into a single factor (Field, 2018). As a result, the variables were combined into two factors, namely formal professional development and informal professional development, for the purpose of the multiple regression analysis (see Section 6.4). As explained in Chapter 4, it was important to determine whether the selected variables correlate with one another.

The preliminary scree plot for the variables confirmed that there are two clear components. The inflexions in the graph warranted components one and two to be retained. Figure 6.1 presents the inflexions in the scree plot.

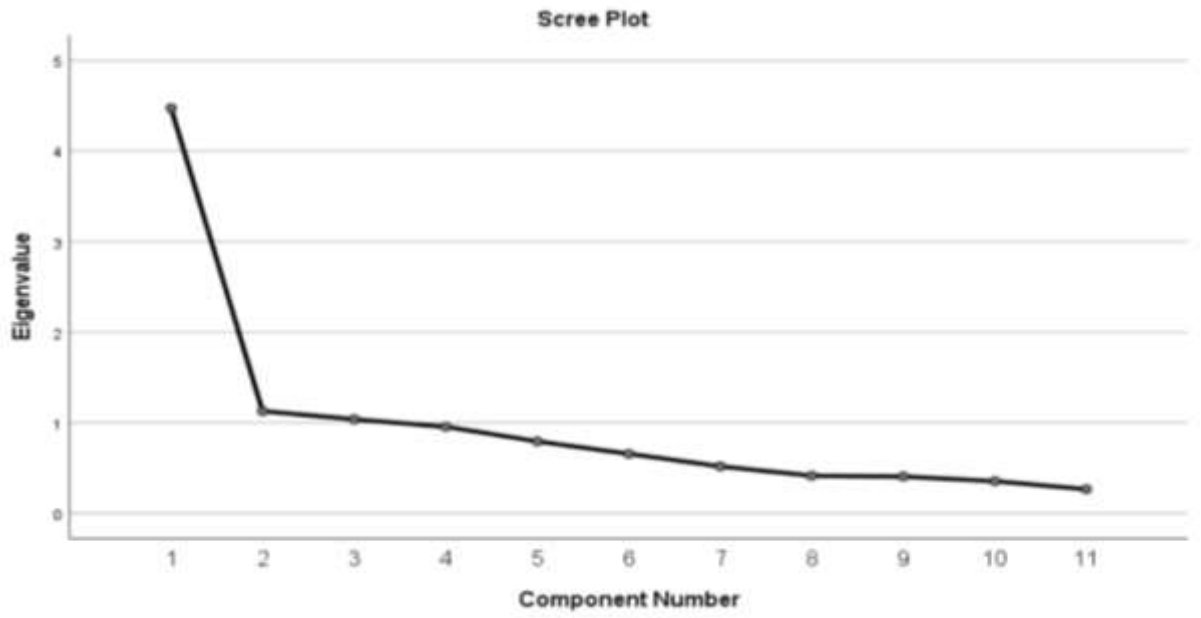

Figure 6.1: Formal and Informal Professional Development Scree Plot

The formal and informal professional development variables included in the PCA are presented in Table 6.4.

Table 6.4: Variables Included in the Principal Component Analysis

Factor	Variable Name	Variable Description
Formal Professional Development	ATBG06	Hours spent in seminars
	ATXGO6B	Currently registered for a qualification related to your specialisation
Informal Professional Development	ATBG07E	Collaboration to plan instruction
	ATBG09A	Sharing of teaching experiences
	ATBG09B	Observing other teachers

Factor	Variable Name	Variable Description
	ATBG09C	Working together on a particular topic
	ATBG09D	Working with teachers from other schools on the curriculum
	ATBG09E	Working with teachers from other grades to ensure continuity in learning
	ATBG09F	Setting goals and monitoring achievement
	ATBG09G	Sharing informational materials
	ATBG09H	Attending cluster meetings

To test the adequacy of the sample, two tests were performed, as shown in Table 6.5.

Table 6.5: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.876
Bartlett's Test of Sphericity	.000

The Bartlett's Test of Sphericity was significant at (p < .000), which further indicates that the selected variables correlate with one another. Furthermore, the Kaiser-Meyer-Olkin (KMO) statistic was .876, which makes it possible to classify the sample as great (Roux, 2015).

Oblique rotation was used for the PCA as there could have been possible associations between the underlying factors in theoretical terms (Roux, 2015). PCA used all the variables describing formal and informal professional development, as explained in the conceptual framework and Table 6.4 (above). The communalities in the PCA explain the individual variance of the variables included in the analysis. Table 6.6 presents the extraction scores for the formal and informal professional development variables.

Table 6.6: Principal Component Analysis Communalities

Variable Description	Extraction
Hours spent in seminars	.452
Currently registered for a qualification related to your specialisation	.246
Collaboration to plan instruction	.429
Sharing of teaching experiences	.529
Observing other teachers	.541
Working together on a particular topic	.631
Working with teachers from other schools on the curriculum	.596
Working with teachers from other grades to ensure continuity in learning	.611
Setting goals and monitoring achievement	.584
Sharing informational materials	.584
Attending cluster meetings	.397

Since all the extraction values are positive, a positive correlation between the formal and informal professional development variables is evident. Table 6.7 (below) portrays the component matrix in the PCA.

Table 6.7: Component Matrix

Factor	Variable Description	Component 1	Component 2
Formal Professional Development	Hours spent in seminars	-.110	-.663
	Currently registered for a qualification related to your specialisation	.063	.492
Informal Professional Development	Collaboration to plan instruction	.301	.582
	Sharing of teaching experiences	.727	.018
	Observing other teachers	.713	-.179
	Working together on a particular topic	.793	-.056
	Working with teachers from other schools on the curriculum	.738	-.226
	Working with teachers from other grades to ensure continuity in learning	.776	-.093
	Setting goals and monitoring achievement	.763	.036
	Sharing informational materials	.757	.103
	Attending cluster meetings	.630	.021

The component matrix table reveals that the first two variables could be grouped together to form a scale for formal professional development. The first component indicates a negative correlation between the formal professional development variables (hours spent in seminars and current registration for a qualification related

to your specialisation). The decision to retain the negatively correlated variable in the formal professional development scale is two-fold. Firstly, Grace-Martin (2020) explains that the goal of PCA is to identify optimal weights. Therefore, if all the variables are positively correlated with one another, all the loadings will be positive as well. If negative correlations between the variables exist, some of the loadings might be negative as well. According to Grace-Martin (2020), it is therefore possible to consider negative factor loadings when conducting PCA. Consequently, it would be possible to explain the negative correlations between these two variables in the current study. It would make sense that teachers who are currently registered for a further qualification would not spend as much time attending seminars or workshops as their peers who are not registered for a further qualification. For that reason, when more teachers are registered for a formal qualification, fewer teachers would attend seminars and workshops. Similarly, when fewer teachers are registered for a further qualification, more teachers would attend seminars or workshops. Secondly, the PIRLS Literacy 2016 teacher questionnaire contained only two items that directly related to formal professional development, and both items had to be retained in order to create a scale for formal professional development.

The rest of the variables could be grouped together. A total variance of 40.7% can be explained by the informal professional development scale, whereas an additional 50.9% of the variance can be explained by the formal professional development scale. Although the component matrix table indicates that the variable *collaboration to plan instruction* can easily be grouped with the formal professional development variables, the variable was used as a part of the informal professional development scale for the purpose of the multiple regression analysis as it was conceptually a better match and, given the sample size, still acceptable with a factor loading of 0.301.

The formal and informal professional development scales were accordingly retained and used in the multiple regression analysis.

6.4 STANDARD MULTIPLE REGRESSION ANALYSIS

In an attempt to answer the study's main research question — *What is the relationship between teacher profiles, teachers' participation in formal and informal professional development and Grade 4 learners' reading literacy achievement when controlling for*

the socio-economic status of the learners? — a standard multiple regression analysis was conducted by using the IDB Analyzer. The standard multiple regression analysis is also discussed in Section 4.6.2.

A regression model was built in order to ascertain the correlation between teacher profiles in terms of teachers' age, years of experience and formal qualifications, teachers' participation in formal and informal professional development and Grade 4 learners' reading literacy achievement, while controlling for the socio-economic status of the learners. In other words, the regression model for this study took into account formal and informal professional development variables, as well as teacher profile variables and the socio-economic status of the learners.

The regression equation for this study is presented as follows:

$$\boldsymbol{Reading\ literacy\ achievement_i}$$

$$=(b_0+b_1 Formal\ Professional\ Development_i+$$
$$b_2 Informal\ Professional\ Development_i+$$
$$b_3 Teacher\ age_i+b_4 Teacher\ experience_i+b_5 Teacher\ qualification_i+$$
$$b_6 Economically\ disadvantaged\ background_i+$$
$$b_7 Economically\ affluent\ background_i) + \varepsilon_i$$

The null model for the multiple regression analysis is as follows:

$$H_0= b_1+b_2+b_3+b_4+b_5+b_6+b_7= 0$$

The null hypothesis suggests the possibility that learner achievement may not be related to teacher profiles or teachers' participation in formal or informal professional development activities when controlling for the socio-economic status of the learners.

For this model, a forced entry method was used as a researcher does not decide on the order in which predictor variables enter the regression model (Field, 2018). The model statistics for this study's regression model is presented in Table 6.8.

Table 6.8: Model Statistics for this Study's Multiple Regression Model

R-Square	R-Square (s.e.)	Adjusted R-Square	Adjusted R-Square (s.e.)
0.11	0.4	0.11	0.4

The R-square and adjusted R-square explain the variance in the outcome — in this case, Grade 4 learners' reading literacy achievement. An adjusted R-square value may be used to assess the accuracy of the model as the model accounts for the population (Field, 2018). Since the R-square value and the adjusted R-square value are equal, it indicates good cross validity. It seems that (a) participating in formal and informal professional development activities and (b) teacher profiles in terms of teachers' age, years of experience and formal qualifications (controlling for the socio-economic status of the learners) only explain 11% of Grade 4 learners' reading literacy achievement. In other words, the results of more or less a tenth of the South African Grade 4 learners who participated in PIRLS Literacy 2016 study, can be explained by teacher profiles and teachers' participation in formal and informal professional development activities. Consequently, teachers' participation in formal and informal professional development, as well as teacher profiles do not fully explain Grade 4 learners' poor reading literacy achievement. It is also important to note that the socio-economic status of learners, which was controlled for in the model, explains some of the variance within the model. The variance explained by the predictors is graphically presented by Figure 6.2.

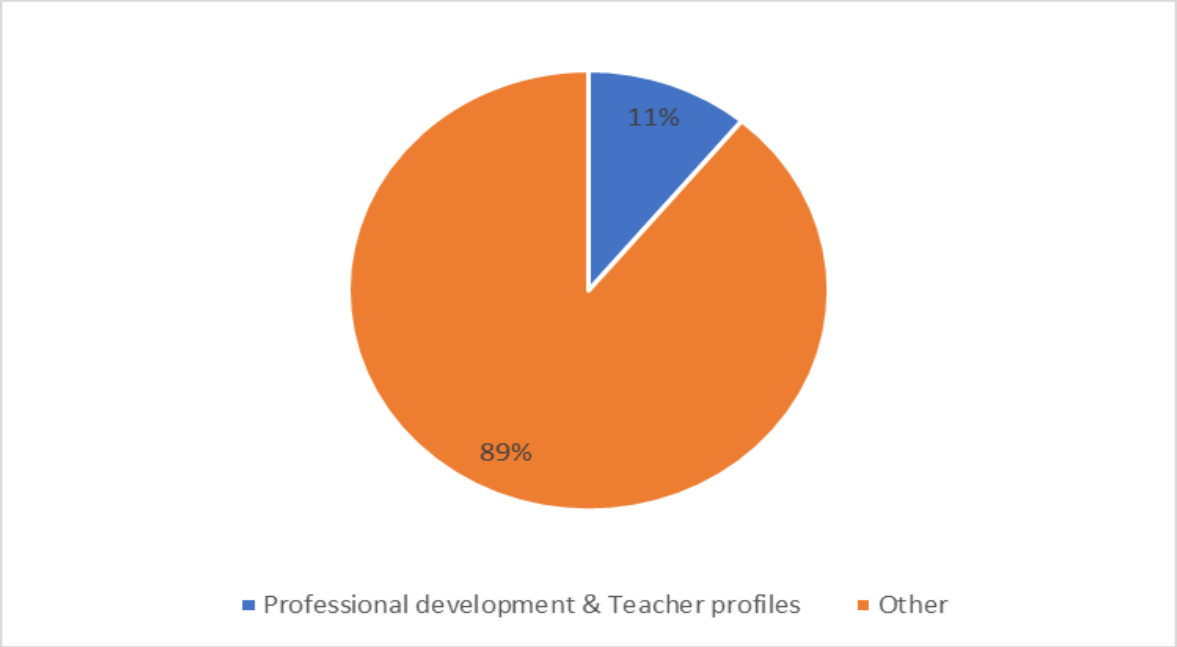

Figure 6.2: Explained Variance of Learner Achievement in Terms of Teacher Profiles and Professional Development

The regression coefficients for this model is presented in Table 6.9.

Table 6.9: Regression Coefficients for this Study's Multiple Regression Model

Variable	Regression coefficient	SE	t-value
Constant	367.37	23.91	15.37
Formal professional development	7.23	12.75	0.57
Informal professional development	-1.48	3.42	-0.43
Teachers' age	10.34	25.25	0.41
Teachers' years of experience	2.03	14.32	0.14
Teachers' formal qualifications	14.65	13.46	1.09

Variable	Regression coefficient	SE	t-value
Economically disadvantaged background	-66.50	15.10	-4.40
Economically affluent background	37.67	29.90	1.26

The constant in Table 6.9 refers to Grade 4 learners' reading literacy mean score according to this specific multiple regression model. Unstandardised regression coefficients illustrate the effect of one predictor variable when controlling for the other predictor variables (Field, 2018). The values of the other variables can be added to the mean or subtracted from the mean to determine what learners' mean score would be when the specific variable is taken into consideration. The mean would accordingly change, based on specific teacher profiles and teachers' participation in formal and informal professional development activities in this model. The relationship between learner achievement (the constant) and the other values in the model is represented by the sign in front of the regression coefficient. A positive relationship is represented by a regression coefficient without a sign, while a negative relationship is represented by a negative (-) sign (Khumalo, 2015). The model constant, 367.37 (SE = 23.91)[44] represents the mean reading achievement when no effect is present. It is also present in the regression equation as the intercept (b_0). The regression model also reflects the standard error related to the regression coefficients. The standard error indicates the average distance the observed value strays from the regression line. A standard error of more than 20 points should be interpreted with caution. Table 6.6 shows that the mean score for this model would only improve by 7.23 points (SE = 12.75) resulting in a mean score of 374.60, if teachers engaged in formal professional development activities. Similarly, the mean score for this model would decrease by 1.48 points (SE

[44] Note that the model constant does not correlate with the average achievement of South African Grade 4 learners, due to the model specifications.

= 3.42) if teachers engaged in informal professional development activities, resulting in a mean score of 365.89.

From Table 6.9 it is evident that none of the original variables in the conceptual framework for this study would significantly change, based on this specific multiple regression model. However, when taking into account whether learners come from disadvantaged or affluent backgrounds, the mean score would change significantly. When learners come from disadvantaged backgrounds the model's mean score would decrease by 66.50 points (SE = 15.10), resulting in a mean score of 300.87 and when learners come from affluent homes the model's mean would increase by 37.67 points (SE = 29.90), resulting in a mean score of 405.04. Learners who come from affluent backgrounds, as well as teachers' age should, however, be interpreted with caution because the standard error is more than 20 points.

The regression model further presents the regression coefficient's t-value, which displays whether or not the added value may be seen as significant in the explanation of Grade 4 learners' reading literacy achievement or not. The coefficient may be considered significant at a 95% confidence interval when the t-value is above 1.96 and, if the t-value is above 2.58, the coefficient is significant at a 99% confidence interval (Roux, 2015). Table 6.9, therefore, reveals that only the value *economically disadvantaged background* can be interpreted with confidence as it portrays a t-value of -4.40, which is the only value above 1.96 that would indicate some level of significance. Since the other values all portray a t-value lower than 1.96, this model can be interpreted as being insignificant related to Grade 4 learners' reading literacy achievement since the values relating to teacher profiles and formal and informal professional development are overshadowed by learners' socio-economic backgrounds.

Although various iterations of the model were conducted in an attempt to identify one that would explain sufficient variance and significance, the various models indicated that teachers' participation in formal and informal professional development activities has little significance related to Grade 4 learners' reading literacy achievement.

Two research sub-questions were identified to aid the answering of the main research question of this study:

1. What is the relationship between teacher profiles and learners' reading literacy achievement?
2. To what extent is learner achievement associated with teachers' participation in formal and informal professional development activities?

The multiple regression model (Table 6.9) for this study proved that there is no statistically significant relationship between the teacher profile variables selected for this study's conceptual framework and Grade 4 learners' reading literacy achievement. Thus, the answer to the first research sub-question informs that teacher profiles, in terms of teachers' age, years of experience and formal qualifications, are not strong predictors of learner achievement.

However, the socio-economic status of the learners could be interpreted as the only predictors in the regression model which is significantly related to learner achievement.

The multiple regression model (Table 6.9) further proved that teachers' participation in formal and informal professional development activities is not related to Grade 4 learners' reading literacy achievement. Therefore, the answer to the second research sub-question also informs that little to no association between teachers' participation in formal and informal professional development and learners' reading literacy achievement exists. This means that whether or not teachers participate in formal and informal professional development activities, did not make a difference in learners' achievement in the PIRLS Literacy 2016 study. The null hypothesis for the model is thus accepted.

There could be various reasons for the statistical insignificance of teachers' participation in formal and informal professional development activities. First, the possibility exists that the measurement of professional development in PIRLS Literacy 2016 was inadequate and did not fully cover all the professional development activities that teachers might engage in. Secondly, the field of professional development was probably not fully covered in the teacher questionnaire. Thirdly, the response options might have been unclear to some of the teachers when answering the teacher questionnaire, or they did not clearly understand the questions. Fourthly, teachers might have struggled with the completion of the questionnaire as it is not something

that they do frequently. In the fifth place, teachers' lack of knowledge about the completion of the questionnaire could have resulted in the selection of more than the required items, which could have led to the missing percentages in the data. Finally, some teachers might have answered the questions regarding their participation in formal and informal professional development activities untruthfully because they are aware of the SACE's expectations regarding participation in professional development.

6.5 CONCLUSION

The inferential statistics for this study were discussed in this chapter. Reliability analyses were conducted to determine the reliability of items for further inferential analysis. A Cronbach's Alpha value of 0.5 was used as a norm during the reliability analysis. Although the formal professional development variables did not score values above 0.5, it was still used in further inferential analysis as the overall reliability score for the formal and informal professional development variables combined was 0.71, which deemed all the variables reliable.

Principal component analysis explained how the formal and informal professional development scales, for further use in the multiple regression analysis, were created and how the formal and informal professional development variables correlate with one another.

The purpose of multiple regression analysis was to answer the research questions of this study. The regression analysis concluded that participating in either formal or informal professional development activities is not significantly related to Grade 4 learners' reading literacy achievement, as it did not obtain t-values above 1.96. The teacher profile variables (teachers' age, years of experience and formal qualifications), taken from the study's conceptual framework, also indicated little significance to learner achievement as it did not obtain t-values above 1.96. The socio-economic status of learners was also accounted for in the model through the incorporation of the variables *disadvantaged background* and *affluent background* of learners. The value *economically disadvantaged backgrounds* obtained a t-value of -4.40. It was, however, evident that learners' socio-economic status overshadowed the teacher profile variables, as well as teachers' participation in formal and informal professional

development activities. The null hypothesis for the model was accordingly accepted because the selected teacher profile variables and teachers' participation in formal and informal professional development are not significantly related to Grade 4 learners' reading literacy achievement.

Although the regression model revealed that teachers' participation in professional development activities seems to be statistically insignificant in terms of learner achievement, this finding does not mean that participation in professional development is educationally insignificant. The educational significance of teachers' engagement in professional development activities will be further considered in Chapter 7.

CHAPTER 7
DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

The purpose of this study was to determine a possible relationship between (a) teacher profiles in terms of teachers' age, years of experience and formal qualifications, (b) teachers' participation in formal and informal professional development activities and (c) Grade 4 learners' reading literacy achievement when controlling the socio-economic status of the learners. Secondary analysis was used to analyse the South African Grade 4 learner achievement data as well as contextual data from the teacher and school questionnaires. The data obtained in the original study were representative of South Africa; it used a sample of 12 810 Grade 4 learners. The sample was stratified according to language and province. Chapter 2 and Chapter 4 both described the data analysis procedures used to perform the analyses. The descriptive results were presented in Chapter 5, after which Chapter 6 presented the results and discussion of the regression analyses.

Chapter 7 provides a summary of the study and includes an overview of the literature that lead to the framing of the research questions and the research design (Section 7.2). Section 7.3 presents the results related to the research questions. Section 7.4 reflects on the conceptual framework specifically designed for this study, as well as the methodology applied to this. This is followed by a discussion of the strengths and limitations of the study (Section 7.5). Section 7.6 discusses the main conclusions of the study, followed by recommendations for policy, practice and further research in Section 7.7. Concluding thoughts about the study are given in Section 7.8.

7.2 SUMMARY OF THE RESEARCH

As discussed in Chapter 1, South Africa underwent various changes in terms of political, contextual, language and curriculum challenges. These challenges require of teachers to continuously provide quality education to learners. Trend studies, such as TIMSS and PIRLS, have indicated that South African learners find it difficult to master the skills of mathematics, science and reading. South Africa is experiencing a reading

crisis (Howie et al., 2017a). Learners' inability to read with comprehension affects their achievement in all subject areas. New policies and legislation have been implemented in an attempt to improve the quality of education provided to learners. However, these policies and legislation have not improved learner performance.

The PIRLS Literacy 2016 study, which was the basis for the current study, forms part of a trend study that measures the trends in children's literacy achievement in conjunction with contextual factors that may be associated with their achievement[45]. South African Grade 4 learners participated in the PIRLS Literacy 2016 study at Grade 4 level because poor reading literacy performance was evident in PIRLS 2006, PIRLS 2011 and prePIRLS 2011 (Howie et al., 2017a). The South African context was discussed in Chapter 1, as well as the important role that teachers play in the provision of quality education. South African Grade 4 learners participated in the PIRLS Literacy 2016 study since the participating learners were required to have four years of formal schooling. The aim of the study was to explore the relationship between teacher profiles, teachers' participation in formal and informal professional development activities and Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners.

Previous research studies revealed that teachers play a crucial role in the success of their learners (Opper, 2019; Pearson, 2017; Richland, 2017). It is important for teachers to adapt to the changes and challenges faced by the country and the education system. For the purpose of this study, teacher profiles comprised teachers' age, years of experience and formal qualifications. Formal professional development activities referred to the attendance of seminars, workshops, conferences, short courses and the improvement of formal qualifications. Informal professional development included collaboration between teachers, sharing of experiences, observing other teachers, discussions, attending cluster and PLC meetings and sharing informational materials. An overview of the literature and the research design are presented in the next two sections.

[45] See Chapter 2 for a thorough discussion on the PIRLS studies and methodology used in the PIRLS Literacy 2016 study.

7.2.1 OVERVIEW OF THE LITERATURE

The meaning and definition of literacy have frequently changed to accommodate the role of new technology and the ability to communicate in modern-day society (Anstey & Bull, 2006). The importance of reading literacy was emphasised in this study as it formed the basis of the PIRLS Literacy 2016 study. The focus on reading literacy in the PIRLS Literacy 2016 study necessitated a distinction between literacy and reading literacy. Reading literacy reflects the ability to understand, use and reflect on written texts and is further important to effectively function in society (Delgadova, 2015). Since this study conducted a secondary analysis of the PIRLS Literacy 2016 study, the PIRLS definition for reading was used in Chapter 3.

In the past few years, South Africa has participated in various studies about the quality of education that learners receive. It is evident that South Africa is experiencing a literacy crisis (Howie et al., 2017a). Learners' poor reading literacy achievement in the PIRLS Literacy 2016 study was a recurrence of the results of previous cycles of PIRLS (2006 and 2011) (Howie et al., 2017a), as well as previous cycles of TIMSS (1995, 1999, 2002, 2011 and 2015) (Reddy et al., 2016) and the SACMEQ Project (2000, 2007 and 2013) (DBE, 2017). During the PIRLS Literacy 2016 study, South African Grade 4 learners achieved the lowest results of the six participating countries and, when placed on the PIRLS 2016 scale, South African learners achieved the lowest results of the 61 participating education systems (Howie et al., 2017a). South African learners' achievement does not seem to improve in spite of numerous attempts by the DBE through the implementation of legislation, policies and initiatives.

Although learners' poor reading literacy achievement could be attributed to various school and contextual factors, this study specifically explored the association between learner achievement, teacher profiles and teachers' participation in formal and informal professional development activities when controlling for the socio-economic status of the learners. This was done to determine the extent to which learner achievement is dependent on teachers' participation in development activities in order to enhance their (the teachers) content and pedagogical knowledge.

The quality of education that learners receive is reflected in their achievement (Khumalo, 2015; Le Cordeur, 2010). Some researchers claim that, among the school

factors, teachers play the most important role in the achievement of their learners (Opper, 2019; Pearson, 2017; Richland, 2017). It is important for teachers to develop professionally and therefore they must keep up to date with the constant changes and challenges in the world. In order to accommodate learners in these changing times, a further shift from teacher-centred instruction to learner-centred instruction needs to take place.

A new conceptual framework, inspired by the work of Desimone (2009) and Chen and McCray (2012), was developed for this study. This framework included learner achievement, teacher profiles and teachers' participation in professional development activities that could be associated with learner achievement when controlling for the socio-economic status of the learners. Figure 7.1 illustrates the conceptual framework that was used for the purposes of this study.

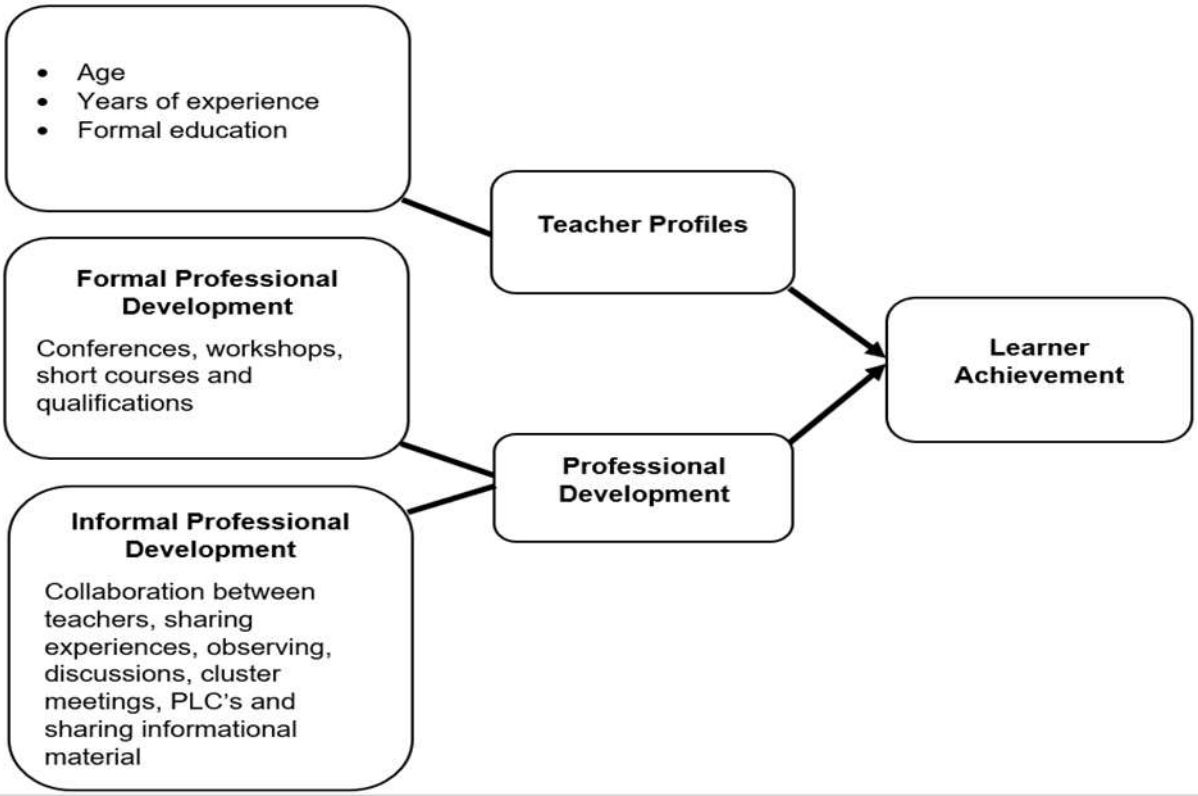

Figure 7.1: Relationship Between Teacher Profiles, Teachers' Participation in Professional Development Activities and Learners' Reading Literacy Achievement

The first element of the framework consisted of teacher profiles since the possibility exists that teacher profiles could be associated with the poor learner achievement. This study focused on teachers' age, years of experience and formal qualifications as components of a teacher's profile. Although there are good teachers in the South African education system, some researchers are of the opinion that poor teachers are holding the education system back (Robinson, 2019). Research also shows that South Africa's teaching force is growing older and that more teachers leave the system than those who enter the system (Armstrong, 2015; SACE, 2011). While previous studies indicated that teachers' age may be related to effectiveness in the classroom (Ismail et al., 2018), other studies indicated different results. Some studies reported teachers younger than 25 years as the most effective (Armstrong, 2015), while other studies suggest that learners taught by teachers who are 41 years and older obtained better achievement results (Ismail et al., 2018).

On the matter of experience, some studies indicated that teachers are most effective in their first few years of teaching, after which their performance levels out (Burroughs et al., 2019; King Rice, 2010; Toropova et al., 2019). Harris and Sass (2010), on the other hand, found that teachers' efficiency in the classroom increases with experience. On the topic of teacher qualifications, researchers found that it is not uncommon that South African teachers are either unqualified or under-qualified to teach (OECD, 2019; Savides, 2017). Although a teaching qualification is important, a qualification alone does not indicate a teacher's competency to teach a subject (Kosgei et al., 2013). However, some studies proved that higher levels of qualifications are associated with better learner achievements (Kosgei et al., 2013), while other studies revealed that advanced degrees are not associated with better teacher productivity (Harris & Sass, 2010).

The second element of the framework relates to teachers' participation in formal and informal professional development activities because of the possible association with poor learner achievement. Various studies reported that effective professional development is required to improve teacher efficiency in the classroom (Chen & McCray, 2012; Desimone, 2009), yet it still remains a challenge in the South African context (Mphahlele & Rampa, 2014). Attendance of professional development activities is vital to adapt to the changes and challenges in the education system. The

DBE implemented various initiatives, programmes, policies and legislation in an attempt to improve learner performance. With regard to professional development, the IQMS system and SACE's CPTD[46] system were implemented to provide teachers with opportunities to engage in formal and informal professional development activities and to regulate teachers' participation.

In the current study, a distinction was made between formal professional development and informal professional development. As mentioned before, formal professional development activities refer to the attendance of seminars, workshops, conferences, short courses and the improvement of qualifications. Informal professional development includes collaboration between teachers, sharing of experiences, observing other teachers, discussions, attending cluster and PLC meetings and sharing informational materials. Various research studies have been conducted concerning formal professional development (Chen & McCray, 2012; DBE, 2018a; Desimone, 2009; Gulston, 2010; Kang et al., 2013; OECD, 2019); however, little is known about the association between teachers' participation in informal professional development activities and learner achievement. Studies on professional development reported that most South African teachers do engage in formal professional development activities. However, the effectiveness of their formal professional development activities is debatable as this study's descriptive and inferential findings indicated that teachers' participation did not lead to improved learner achievement.

Although it was not part of the conceptual framework, learners' socio-economic status was controlled for in the multiple regression analysis because learners' socio-economic background has proved to greatly affect learner achievement.

7.2.2 RESEARCH DESIGN

In this study, a secondary analysis of the PIRLS Literacy 2016 study was conducted to enhance existing findings regarding the relationship between learners' reading literacy achievement, teacher profiles and teachers' engagement in formal and

[46] See Section 3.7 for an elaborate discussion on the IQMS system and SACE's CPTD system.

informal professional development activities. As explained in Chapter 4[47], there are advantages and disadvantages of conducting a secondary analysis. This method enables researchers with limited resources and time to conduct their research (Johnston, 2014; Roux, 2015). Secondary analysis should, however, be conducted with caution (Cheng & Phillips, 2014; Johnston, 2014).

Secondary analysis was specifically used in this study to investigate teacher profiles and teachers' participation in formal and informal professional development activities, as reflected in the teacher questionnaire, and the association it may have with learners' reading literacy achievement. Additionally, the socio-economic status of the learners was controlled for. This study was conducted through a post-positivistic lens since all research is conducted with an awareness of subjectivity (Nieuwenhuis, 2016) and researchers should be cautious when considering subjective interpretations (Adam, 2014).

Standard multiple regression analysis was used to establish the relationship between teacher profiles in terms of teachers' age, years of experience and formal qualifications, teachers' participation in formal and informal professional development activities and Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of the learners. Scales were created in order to conduct the multiple regression analyses. The analyses were based on the conceptual framework for this study as presented in Chapter 3. During the standard multiple regression analyses, Grade 4 learners' reading literacy achievement was selected as outcome variable. The predictor variables included the teacher profile scales (teachers' age, teachers' years of experience and teachers' level of formal qualification), as well as the formal and informal professional development scales. The socio-economic status of learners was also controlled for in the model. The results were thoroughly presented in Section 6.4 and are briefly summarised in Section 7.3 below.

[47] See Section 4.4 for details.

7.3 SUMMARY OF RESEARCH QUESTIONS AND RESULTS

This study explored the effect that teacher profiles and teachers' participation in formal and informal professional development activities has on South African Grade 4 learners' reading literacy achievement while controlling for the socio-economic status of the learners by conducting a secondary analysis of the PIRLS Literacy 2016 achievement data. The main research question for the study was: *What is the relationship between Grade 4 learners' reading literacy achievement, teacher profiles and teachers' participation in professional development when controlling for the socio-economic status of the learners?*

To thoroughly explore the main research question, it was separated into two sub-questions which are presented in Section 7.3.1 and Section 7.3.2, respectively. The findings regarding the main research question are briefly summarised in Section 7.3.3. The results of the regression analysis are critically discussed in correspondence with Chapter 3.

7.3.1 EVIDENCE TO ANSWER SUB-QUESTION 1

The first research sub-question intended to explore the effect that specific teacher profiles had on Grade 4 learners' reading literacy achievement in the PIRLS Literacy 2016 study. Teacher profiles comprised teachers' age, years of experience and formal qualifications.

Previous studies on the topic of teacher profiles indicated that teachers' age, teachers' years of experience and teachers' level of formal qualification may be related to learners' reading literacy achievement. Studies relating to teachers' age have been contradictory as some studies suggested that teachers younger than 25 years and older than 50 years outperform their peers (Armstrong, 2015), whereas other studies revealed that teachers younger than 25 years are more effective than their peers and that teachers older than 41 years are less effective in the classroom (Burroughs et al., 2019; King Rice, 2010). The descriptive results presented in Chapter 5 support the first claim because learners taught by teachers younger than 25 years and older than 60 years obtained the best results in the PIRLS Literacy 2016 study.

Teaching experience refers to the number of years that a teacher has been teaching[48]. Studies regarding teachers' years of experience also revealed opposing results. Some researchers suggest that teachers are most productive in their first few years of teaching (Burroughs et al., 2019; King Rice, 2010; Toropova et al., 2019), whereas others found that teachers efficiency increases with experience (Harris & Sass, 2010; King Rice, 2010). The descriptive results in Chapter 5 revealed that learners taught by teachers with less than 5 years of experience and teachers with between 10 and 20 years of experience obtained the highest scores in the PIRLS Literacy 2016 study.

Qualification refers to the level of formal schooling completed by teachers. However, a formal qualification alone does not indicate a teacher's competency to teach a subject (Kosgei et al., 2013). The literature regarding teachers' level of qualification also contains contradictory results as some studies suggest that learner performance increases when the teacher's level of qualification is higher (Kosgei et al., 2013), whereas other studies found that advanced degrees did not lead to improved teacher productivity (Harris & Sass, 2010). The descriptive results presented in Chapter 5 revealed that learners taught by teachers who obtained a bachelor's degree obtained the best results. However, there was only a 7-point difference between the achievement of learners taught by teachers with a bachelor's degree and those who did not complete Grade 12, which make the results questionable.

Although previous studies on the topic of teacher profiles, as well as the descriptive analyses presented in Chapter 5, indicated that teacher profiles are in some way related to learner achievement, none of the selected teacher profile variables were strong predictors of reading literacy achievement in the standard multiple regression model[49] for this study. Teachers' age as predictor for reading literacy achievement would only make a 10.34 (SE = 25.25) point difference to the constant value of reading literacy achievement. Teachers' years of experience as predictor would only make a 2.03 (SE = 14.32) point difference. In this study's specific model, teachers' level of

[48] There is not necessarily a correlation between the age and experience of teachers because some teachers might have had a different occupation before starting to teach.

[49] The multiple regression model is presented in Section 6.4.

formal qualification has a higher predictor value than the other teacher profile predictors as a 14.65 (SE = 13.46) point difference in learners' reading literacy achievement would be evident if teachers obtained a higher level of qualification.

Furthermore, the specific multiple regression model for this study revealed that the teacher profiles chosen for this study are not statistically significant in relation to Grade 4 learners' reading literacy achievement. None of the selected teacher profile predictors had a t-value[50] above 1.96, which emphasised the statistical insignificance. Therefore, there is no statistically significant relationship between the selected teacher profiles and learners' reading literacy achievement.

Learners' socio-economic status was only controlled for in the model; however, the socio-economic status of learners overshadowed the other predictors in the model. The predictor *economically disadvantaged background* would make a -66.50 (SE = 15.10) point difference to the constant *reading literacy achievement,* which means that learners from economically disadvantaged homes are more than a year behind their peers from economically affluent homes. The strength of the predictor *economically disadvantaged background* is echoed by the predictor *economically affluent homes* as a 37.67 (SE = 29.90) point difference in learner achievement would be evident if learners come from economically affluent homes. Consequently, learners from economically affluent homes are almost a year ahead of their peers. However, the standard error for *economically affluent homes* suggests that the predictor should be interpreted with caution.

7.3.2 EVIDENCE TO ANSWER SUB-QUESTION 2

The second research sub-question relate to teachers' participation in formal and informal professional development activities. Professional development refers to activities and processes intended to improve teachers' knowledge, methods of instruction, and the learning outcomes of learners (Kang et al., 2013). Formal professional development includes the attendance of seminars, workshops, short

[50] The t-value indicates statistical significance. The coefficient may be considered as significant at a 95% confidence interval when the t-value is above 1.96, and if the t-value is above 2.58, the coefficient is significant at a 99% confidence interval (Roux, 2015).

courses, conferences and the improvement of qualifications. Informal professional development includes collaboration between teachers, sharing of experiences and materials, working with other teachers and attending cluster and PLC meetings. Many research studies have been conducted on the topic of formal professional development and its association with teachers' effectiveness in the classroom (Chen & McCray, 2012; DBE, 2018a; Desimone, 2009; Gulston, 2010; Kang et al., 2013; OECD, 2019). On the other hand, insufficient literature is available on the topic of informal professional development.

Teacher development is essential for good quality education (Beckmann, 2018; Burroughs et al., 2019; Kang et al., 2013; Toropova et al., 2019; Wei et al., 2009); however, it still remains a challenge in the South African education system (Mphahlele & Rampa, 2014). As discussed in previous chapters, the education system in South Africa has experienced multiple changes in the past few years, to which teachers had to adapt. The DBE implemented various programmes and policies regarding teacher development in order to help teachers adapt. Most research studies regarding professional development merely focused on teachers' attendance of formal professional development activities but have not focused on the possible association of these activities with achievement.

TALIS 2018 reported that 91% of South African teachers attended at least one professional development activity in the past year (OECD, 2019), while 88% of teachers reported satisfaction with the training that they received (OECD, 2019). However, these results are concerning as the DBE expects teachers to engage in multiple professional development activities. Furthermore, Grade 4 learners' low reading literacy achievement in the PIRLS Literacy 2016 study makes teachers' competence questionable, which further raises the question of the effectiveness of professional development activities presented in South Africa. This study's findings about learners' low reading literacy achievement are supported by that of other researchers who found that some teachers do not participate in professional development activities or they feel that they do not benefit from such activities (Singh, 2011). Some teachers also report that they are not monitored or supported when it concerns their attendance of professional development activities (Bernadine, 2018; Nel et al., 2016).

To monitor teachers' participation in formal and informal professional development, the DBE implemented the IQMS and SACE's CPTD system. In the IQMS, professional development forms a part of the teacher's PGP, which aims to provide a guideline for the areas in which the teacher needs development. SACE further monitors teachers' participation in professional development activities through the CPTD system[51] in which teachers are required to obtain at least 150 CPTD-points in a three-year cycle by attending formal and informal professional development activities.

The PIRLS Literacy 2016 study specifically addressed formal professional development in the teacher questionnaire by asking about teachers' attendance of seminars and whether they are currently registered for a further qualification. It was, however, possible to include informal professional development as the teacher questionnaire also addressed teachers' engagement in collaborative activities, which the SACE also regards as forms of professional development.

The descriptive analysis of the PIRLS Literacy 2016 results presented in Chapter 5 revealed that, although more South African teachers than their international peers engage in more than 16 hours of formal professional development activities, most South African teachers do not meet the criteria set by the DBE. Furthermore, learner achievement is not dependent on whether or not teachers engage in formal professional development activities.

The descriptive results also showed that most learners were taught by teachers who engaged in informal professional development activities. The results showed that, with the exception of setting goals and monitoring achievement, teachers' participation in informal professional development activities could not be associated with improved learner performance. In some cases, learners taught by teachers who did not participate in informal professional development activities on a regular basis performed better than their peers taught by teachers who regularly participated in the activities.

[51] SACE and the CPTD system are explained in Section 3.6.

The results obtained during the standard multiple regression analysis[52] support the results obtained during the descriptive statistics, as neither formal professional development nor informal professional development was strong predictors of learners' reading literacy achievement. Learner achievement would only improve by 7.23 points (SE = 12.75) if teachers engaged in formal professional development. A further -1.48-point (SE = 3.42) difference would be evident if teachers did not engage in informal professional development activities. Furthermore, neither formal professional development nor informal professional development had a t-value above 1.96, which indicates that teachers' participation in formal and informal professional development is not statistically significant in relation to Grade 4 learners' reading literacy achievement. Thus, the multiple regression model proved that there is little association between teachers' participation in formal and informal professional development activities and learners' reading literacy achievement.

7.3.3 EVIDENCE TO ANSWER THE MAIN RESEARCH QUESTION

All the predictor variables were used in the multiple regression model for this study in an attempt to determine the relationship between Grade 4 learners' reading literacy achievement, teacher profiles and teachers' participation in formal and informal professional development activities when controlling for the socio-economic status of the learners.

The multiple regression model for this study explains 11% of the variance of Grade 4 learners' reading literacy achievement in the PIRLS Literacy 2016 study. Teachers' age, teachers' years of experience and formal qualifications, as well as their participation in formal and informal professional development activities do not explain learners' poor reading literacy achievement. Furthermore, none of the abovementioned predictor variables were statistically strong predictors of learner achievement as none of the predictor variables came close to a 95% confidence interval. This occurrence indicates that no relationship exists between Grade 4 learners' reading literacy achievement, teacher profiles, in terms of teachers' age, years of experience and formal qualifications, and teachers' engagement in formal and

[52] The multiple regression model is presented in Section 6.4.

informal professional development, when controlling for the socio-economic status of the learners.

The results of the multiple regression analysis contradict previous research studies on the topic of professional development as most of these studies indicated the importance of teachers' engagement in formal and informal professional development activities in increasing teachers' effectiveness in teaching (Chen & McCray, 2012; Desimone, 2009; Kang et al., 2013). The results of the multiple regression model, however, support the claim that professional development still remains a challenge in the South African education system (Mphahlele & Rampa, 2014; DBE, 2018b). There could be various reasons for the statistical insignificance of the results of the multiple regression model. The measurement of *professional development* in the PIRLS Literacy 2016 study could have been faulty and therefore failed to deduce enough information from the teachers' responses. Teachers could also have answered the teacher questionnaire untruthfully because they are aware of SACE's expectations regarding attendance of formal and informal professional development activities. Furthermore, the quality of professional development presented to South African teachers could be questionable and because of that most teachers only participate in these activities to adhere to administrative directives (DBE, 2018b). During the 2017 School Monitoring Survey (DBE, 2018b), the ineffectiveness of the monitoring of teachers' participation in professional development activities was noted as there were still teachers in some schools that did not participate in professional development activities. In many cases, reports on staff development were cryptic and little evidence was available (DBE, 2018b). Teachers also felt dissatisfied with the professional development opportunities they received and indicated that self-initiated professional development was most effective (Govender, 2018; Mokhele & Jita, 2010).

While the statistical analysis of teachers' engagement in formal and informal professional development seems to be statistically insignificant, the educational significance of teachers' participation in formal and informal professional activities should be stressed. Teachers' engagement in professional development remains important to enhance teachers' content and pedagogical knowledge (DBE, 2018b). Although some teachers experience challenges regarding professional development,

many teachers also experience professional development as a way to improve self-efficacy and job satisfaction (OECD, 2019).

7.4 CONCEPTUAL FRAMEWORK AND METHODOLOGICAL REFLECTIONS

This section reflects on this study's conceptual framework and the methodological decisions made throughout the study. The section is divided into two sub-sections: the conceptual framework (Section 7.4.1) and the methodology (Section 7.4.2).

7.4.1 CONCEPTUAL FRAMEWORK FOR THIS STUDY

Some researchers are of the opinion that, among various school factors, teachers play the most important role in learners' achievement (Opper, 2019; Pearson, 2017; Richland, 2017). Accordingly, a new conceptual framework was developed specifically for this study because no conceptual or theoretical framework exists that explores both teacher profiles and teachers' participation in formal and informal professional development activities. The conceptual framework was inspired by the professional development conceptual frameworks of Chen and McCray (2012) and Desimone (2009). Desimone (2009) stresses that a comprehensive framework for the assessment of professional development should incorporate three aspects, namely, defining effective professional development, explaining how effective professional development affects teachers and learners, and describing the contextual factors associated with professional development. Chen and McCray (2012) also emphasised the importance of professional development activities aimed at real-life classroom experiences.

The conceptual framework for this study was specifically developed to reflect the variables that would be used in the study and their association with learners' reading literacy achievement. The conceptual framework portrays possible direct relationships between teacher profiles and teachers' participation in formal and informal professional development and the relationship it has with learner achievement. The framework, based on the literature, firstly controlled for teacher profiles, including teachers' age, teachers' years of experience and formal qualifications, and the association it has with learner achievement. The second aspect of the framework reflects the possible relationship between teachers' engagement in formal and informal professional development and learner achievement. Teacher profiles and

teachers' engagement in formal and informal professional development represent the input variables, whereas learner achievement represents the output variable.

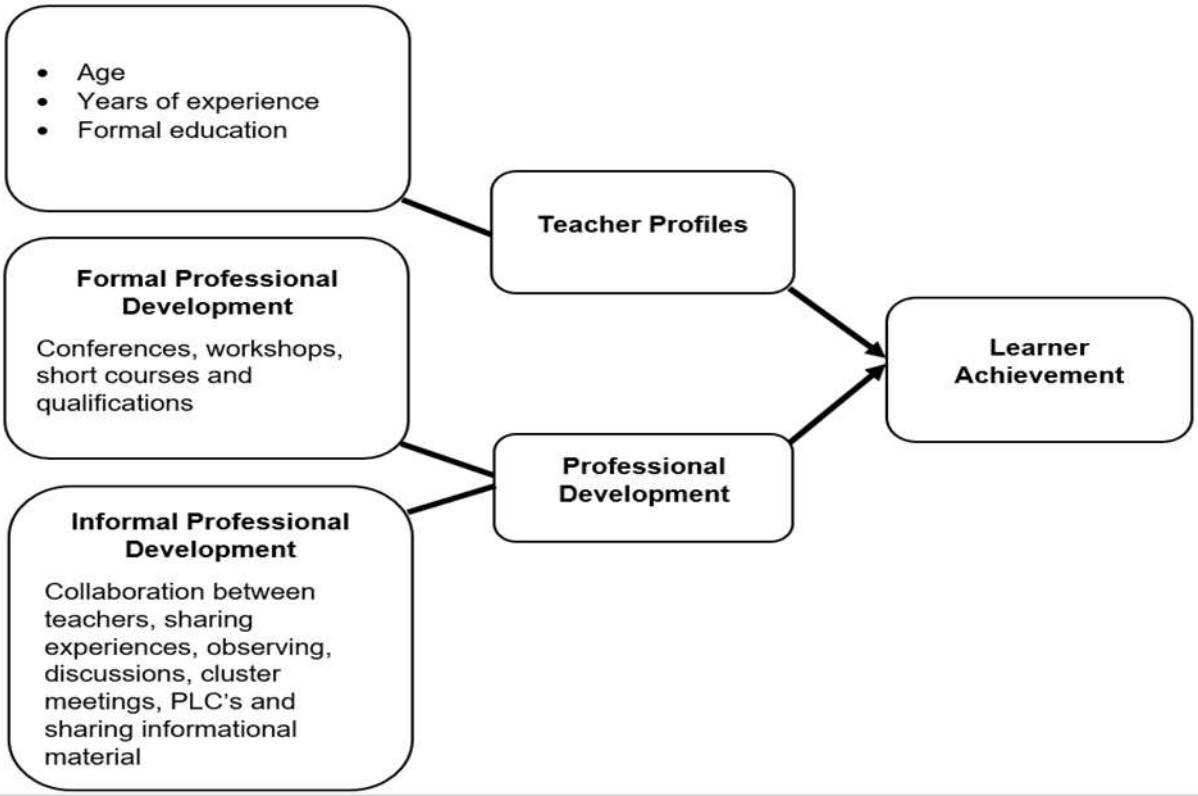

Figure 7.2: Relationship between Teacher Profiles, Teachers' Participation in Professional Development Activities and Learners' Reading Literacy Achievement

Figure 7.2 illustrates the direct relationships that may be associated with learner achievement. Initially, it was hypothesised that teacher profiles and teachers' participation in formal and informal professional development activities may be directly linked to learner achievement. For example, teachers' level of qualification will either lead to improved learner achievement or poor learner achievement. Another example may be that higher engagement in professional development activities may lead to improved learner achievement and a lack of participation in professional development activities may lead to lower learner achievement.

Based on the literature review, various factors may be associated with learner achievement. With regard to teacher profiles, the literature was inconsistent. Although some researchers proved that teacher profiles are in some way related to learner

achievement, not all studies agree. The descriptive analysis indicated that learners taught by teachers with specific teacher profiles may perform better than others, yet the multiple regression analysis results showed no statistically significant relationship between the selected teacher profiles and learner achievement. Nevertheless, the importance of teachers' engagement in professional development activities was emphasised by various researchers (Beckmann, 2018; Burroughs et al., 2019; Kang et al., 2013; Toropova et al., 2019; Wei et al., 2009). However, both the descriptive analysis and the multiple regression analysis revealed no statistically significant relationship between teachers' engagement in formal and informal professional development activities and learner achievement.

The conceptual framework is, however, not completely inadequate, since the educational significance of effective professional development remains intact. Based on the literature regarding the educational significance of professional development, the conceptual framework could be adapted to include only the formal and informal professional development variables with an emphasis on the effective presentation and monitoring of these activities. Figure 7.3 reflects a possible adaption of the conceptual framework, based on the study's findings and the educational significance of teachers' participation in professional development activities.

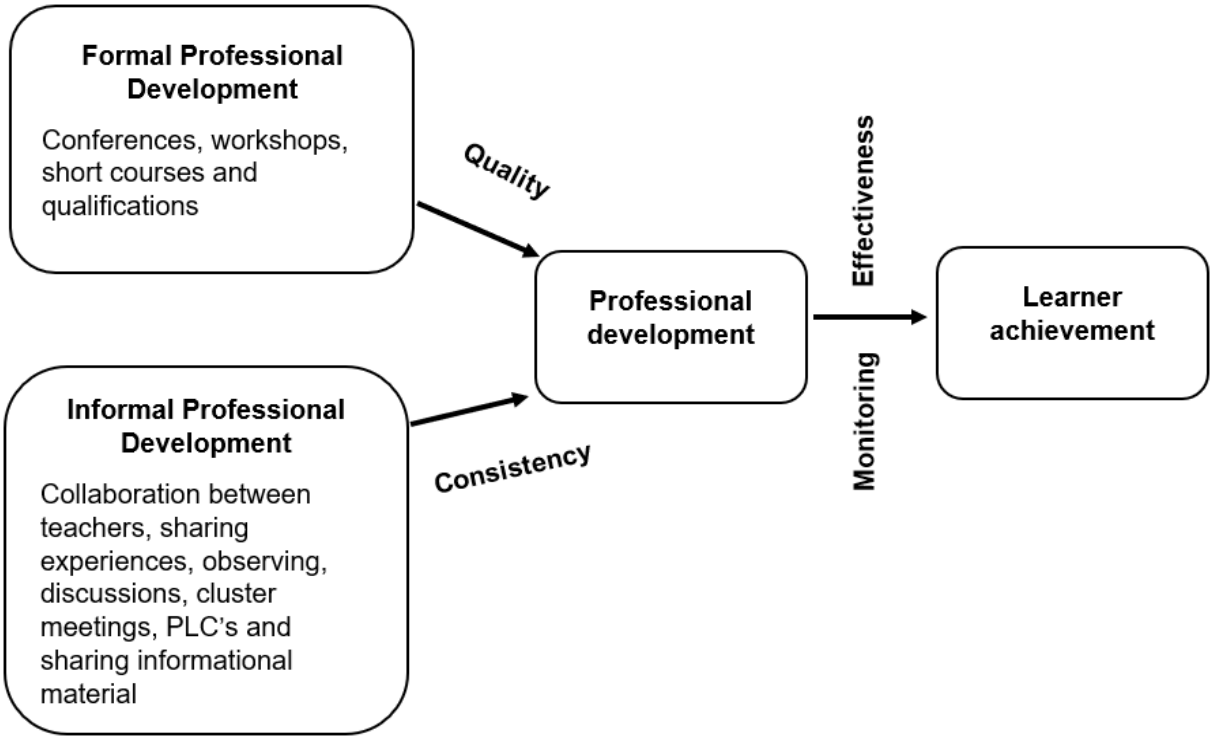

Figure 7.3: Relationship Between Professional Development and Learner Achievement

The adaption of the framework is important because teachers will always have to engage in professional development in order to adapt to the changes and challenges continuously faced by the South African education system. However, it is important to emphasise the importance of good quality development programmes that are frequently implemented, as well as the fact that the effectiveness of these programmes should be monitored by all stakeholders in the education system.

Desimone's model (2009)[53] could further enhance research on teachers' participation in formal and informal professional development as it stresses the importance of effective professional development and how it affects teachers and learners.

[53] Desimone's model (2009) is presented in Section 3.9.

7.4.2 METHODOLOGICAL REFLECTION

This study conducted a secondary analysis on data obtained from the PIRLS Literacy 2016 study. The assessment instruments for PIRLS Literacy 2016 consisted of a literary text and an informational text with accompanying multiple-choice and constructed response questions. Additional contextual data were gathered through questionnaires completed by the principals, teachers, parents and learners. This study utilised the teacher and school questionnaires, which were completed by the teachers of the learners who wrote the tests.

After exploring the available data on formal and informal professional development (see Chapter 5), it became evident that the teacher questionnaire provided little information regarding teachers' participation in formal and informal professional development activities. Only two questions addressed formal professional development. One question asked teachers how many hours they spent on professional development such as workshops, seminars, lesson studies and conferences. The other question asked whether they were registered at an academic institution to improve their qualifications. From these questions, not much could be deduced about teachers' engagement in formal professional development. A lack of evidence on the effectiveness of the professional development attended by teachers can be inferred. Furthermore, in the teacher questionnaire, informal professional development was not specifically addressed as a professional development. However, some of the questions about teachers' collaboration addressed the activities of teachers that are recognised by SACE as level 2 and level 3 professional development. These variables were thus considered as informal professional development activities.

In addition, the questionnaire did not include detailed questions regarding teachers' experiences and the benefits of the collaboration for teachers' teaching practices. Also, teachers might have answered the teacher questionnaire incorrectly as they responded to the questions relating to professional development in a socially desirable way or in a way that they thought was expected of them. It might also have been difficult for teachers to immediately recall the time spent on professional development

if those times were not adequately recorded. This could also have contributed to answers that were not reliable.

Considering the abovementioned limitations, this study could have benefitted from a mixed-methods design as teachers could have provided more qualitative data about their participation in formal and informal professional development activities. A mixed-methods design could have contributed to a more effective way to explore the effectiveness of professional development.

The aim of this study was to determine the extent to which teacher profiles, in terms of their age, years of experiences and formal qualifications, as well as their engagement in formal and informal professional development, may be associated with learner achievement, while controlling for the socio-economic status of the learners. This was done by conducting a secondary analysis of the PIRLS Literacy 2016 Grade 4 learners' reading achievement data. This study was informed by the theories of participative teaching and a learner-centred approach to teaching. The development of this study was further guided by a conceptual framework specifically developed for this study (see Section 3.9), which assisted in the interpretation of the findings.

The research questions (see Section 1.5) were examined through the use of standard multiple regression analysis. The reliability analyses considered all the selected variables reliable to use for further analysis during the multiple regression analysis. The IDB Analyzer was used to conduct the multiple regression analysis to combine the contextual data with the achievement data. The multiple regression analysis was used because it is a suitable technique to assess the association between predictor and outcome variables.

7.5 STRENGTHS AND LIMITATIONS OF THE STUDY

7.5.1 STRENGTHS

As a secondary analysis, this study builds on the knowledge of large-scale studies that have been developed over many years. The strength of the study also lies in the quality and the size of the data supplied by the IEA. Additionally, various quality assurance measures were taken to confirm that the data was accurately captured and made available for secondary analysis (Johansone, 2015).

7.5.2 LIMITATIONS

The following limitations of the study should be noted. As mentioned in Chapter 1, this study only made use of data obtained from the teacher and school questionnaire to access information regarding teacher profiles, teachers' participation in formal and informal professional development, and the socio-economic status of the learners. However, as discussed, the teacher questionnaire provided little information regarding teachers' engagement in formal and informal professional development activities. Furthermore, the effectiveness of professional development was not comprehensively addressed in the questionnaire.

A second limitation of the study was that no additional data were gathered to add to the construct of professional development.

Thirdly, the PIRLS Literacy 2016 data are representative of learners but not of teachers; thus, the results focused on learner achievement. All results were therefore reported in terms of teacher behaviour as it pertains to Grade 4 learners who were tested. Nevertheless, other studies such as the School Monitoring Survey (SMS) and the TALIS are also referred to in terms of the knowledge on teachers' participation in professional development activities in South Africa.

7.6 MAIN CONCLUSIONS

Based on the findings of this study, it appears that neither teacher profiles nor teachers' engagement in formal and informal professional development has a statistically significant association with learner achievement. Accordingly, the following conclusions were drawn from the findings:

7.6.1 Teacher profiles are not statistically associated with improved achievement results

For the purpose of this study, teacher profiles included teachers' age, years of experience and level of formal qualifications. The PIRLS Literacy 2016 cycle, as well as previous PIRLS cycles (2006 and 2011), provided evidence that learners taught by teachers older than 60 years achieved the best results (Howie et al., 2008; Howie et al., 2012; Howie et al., 2017a). Furthermore, the different cycles of PIRLS also confirmed that most learners were taught by teachers who only completed post-

secondary training (Howie et al., 2008; Howie et al., 2012; Howie et al., 2017a). Although the achievement of learners taught by teachers of specific ages and holding specific qualifications can be determined, the teacher profiles would still not make a statistically significant difference in learner achievement.

The standard multiple regression model for this study confirmed that none of the abovementioned teacher characteristics are statistically significant when determining the reasons for learners' poor reading literacy achievement in the PIRLS Literacy 2016 study. Contradictory findings in the literature regarding teachers' age, years of experience and level of formal qualification (Armstrong, 2015; Burroughs et al., 2019; Harris & Sass, 2010; King Rice, 2010; Kosgei et al., 2013; Toropova et al., 2019) confirm the insignificance of these teacher profiles towards learner achievement. Therefore, whether learners are taught by younger or older teachers, teachers with little experience or teachers with multiple years of experience or whether or not teachers are adequately qualified or not, it would not lead to significant improvement or deterioration in learner achievement.

7.6.2 Teachers' participation in formal and informal professional development activities are not statistically associated with improved learner achievement

Although the importance of teachers' engagement in professional development activities was emphasised in the literature, both the descriptive analysis and the multiple regression analysis for this study indicated that teachers' engagement in either formal or informal professional development activities would not lead to improved learner achievement.

Especially the results of the multiple regression model are concerning since researchers place much emphasis on the importance of teachers' engagement in professional development activities to stay up to date with changes in the education system and to obtain the necessary content and pedagogical knowledge to adequately teach specific subjects (Beckmann, 2018; Chen & McCray, 2012; Desimone, 2009; Toropova et al., 2019; Wei et al., 2010). Yet, the statistical insignificance of teachers' participation in formal and informal professional development provides evidence that South African teachers' engagement in professional development activities are not

associated with good quality teaching by teachers and consequently does not improve learner achievement.

Although various programmes, policies and initiatives have been implemented by the DBE in an attempt to improve learner achievement, these efforts seem to be failing. Furthermore, teachers are required through the SACE's CPTD system to engage in various forms of professional development activities. Provincial departments of education and district offices also encourage teachers to participate in professional development activities and collaborate with other teachers and opportunities. The IQMS has also developed accountability structures, but it has not been sufficiently utilised. Despite these efforts, teachers' participation in formal and informal professional development has not led to improved learner achievement.

Although TALIS and SMS surveys report that most teachers regularly participate in professional development activities and also benefit from these activities (DBE, 2018b; OECD, 2019), the effectiveness of the professional development provided to South African teachers remains questionable.

The ineffectiveness of professional development provided to South African teachers should receive special attention when the results of this study are interpreted. It is also questionable whether teachers' participation in professional development is effectively monitored. The lack of effective monitoring of teachers' engagement is highlighted by various researchers and research studies.

The SMS of 2017 found that primary school teachers spent 36 hours on average attending professional development activities, which is notably less than the target of 80 hours per annum (DBE, 2018a). Furthermore, many teachers reported that they do not participate in professional development activities and various schools had no evidence of teachers' participation in staff development activities (DBE, 2018b). Staff development activities also offer little differentiation in training because more-experienced teachers report that they have to attend the same professional development activities as their peers with less experience (DBE, 2018b).

Some research studies report that not all teachers participate in professional development activities (Singh, 2011) and some teachers feel that they do not benefit

from such activities (Singh, 2011). Many teachers also report that they are not supported or monitored when they participate in professional development activities (Bernadine, 2018; DBE, 2018b; Nel et al., 2016) and that they are dissatisfied with the professional development they receive (Govender, 2018; Mokhele & Jita, 2010).

It is evident that some teachers only participate in professional development activities to adhere to administrative directives. The professional development presented to South African teachers seems to be of inferior quality. Teachers' participation in professional development activities would perhaps only lead to improved learner achievement if the formal and informal professional development activities presented to teachers are of good quality and the attendance of teachers is effectively monitored and supported.

7.6.3 The socio-economic status of learners showed more significant results than teacher profiles and teachers' participation in formal and informal professional development activities

The socio-economic status of learners is a significant predictor of learner achievement as learners who come from economically disadvantaged backgrounds achieved significantly lower results than those coming from economically affluent households. In other words, the socio-economic status of learners showed more significant results than teacher profiles and teachers' participation in formal and informal professional development.

South Africa has one of the most diverse populations in the world in terms of socio-economic status (Spaull, 2019; World Bank, 2017b). More than two decades after apartheid, there are still financial inequalities in the country (Spaull, 2019). In 2015, 13.8 million South Africans lived in extreme poverty, earning below R441 per person per month (Statistics South Africa, 2017). Inequality has been persistent in South Africa and according to the World Bank (2020) it has a Gini coefficient[54] of 0.63, which is one of the highest inequality rates in the world. Annually, the South African government spends billions of Rands on equitable access to education for all South

[54] The Gini coefficient is used to measure economic inequality.

Africans (National Treasury, 2019). Although the South African government attempts to remedy the inequality in the education system, many learners from disadvantaged socio-economic backgrounds are still struggling to perform well as they do not have equal access to infrastructure, resources and services (DBE, 2011a; Howie et al., 2017a).

Researchers have found that learners from disadvantaged backgrounds perform worse in school than their peers (Spaull, 2015). Educational opportunities for disadvantaged learners are limited and their right to quality education is in many cases deprived (Ndimande, 2016). Fobosi (as cited in Gilili, 2020), who is a public service accountability researcher, is of the opinion that learners who attend school in rural areas are destined to fail as they do not have access to quality basic education. Grade 12 learners reported that they have to attend schools where no drinking water is available and where they do not even have textbooks (Gilili, 2020). Many learners who attend school without sufficient resources have a very low pass rate, which makes it almost impossible for them to rise above their circumstances (Gilili, 2020). Hunger also affects learners' ability to learn and learners who frequently do not have access to food may experience developmental impairments in language, motor skills and behaviour (Weber, 2019). The cycle of poverty is driven by poor-quality education that disadvantaged learners receive (Spaull, 2015).

If financial inequality and unequal access to infrastructure, resources and services are taken into account it is understandable that *disadvantaged backgrounds* is a significant predictor of learner achievement.

7.6.4 The educational significance of professional development remains imperative

Despite the fact that teachers' participation in professional development shows no statistical significance, the educational significance of teachers' engagement in professional development activities remains crucial. However, the emphasis should be on the effectiveness of the professional development presented to South African teachers.

Various research studies on the topic of professional development have found that effective professional development plays an important role in teachers' proficiency in

teaching (Chen & McCray, 2012; Desimone, 2009). The DBE (2015) defines effective professional development as the sustainable and positive impact on the quality of education presented to learners. Effective professional development should also result in the improvement of teachers' knowledge and instructional practices (Wei et al., 2010). To enhance the effectiveness of professional development activities presented to teachers, teachers need to be involved in active learning that builds on previous knowledge and stimulates collaboration (DBE, 2015). It should also be context-related and promote critical and systematic reflection (DBE, 2015).

Based on previous research, Darling-Hammond et al. (2017) identified core features of effective professional teacher development that could be used as a guideline for the organisation and presentation of professional development to South African teachers. These core features are as follows:

- They are content focused and support teachers in classroom contexts;
- they incorporate active learning;
- support collaboration and the sharing of ideas;
- use models of effective practice;
- provide coaching and expert support;
- offer feedback and reflection; and
- they are sustainable.

Since many teachers reported that their participation in professional development is not supported or monitored, the need arises for improved monitoring and supporting of teachers with regard to professional development. The DBE, through the IQMS system, has already implemented control mechanisms for teacher growth and improvement, which could include professional development. If effectively used, the following accountability structures on national and school level should be able to support and monitor teachers' engagement in professional development activities and could help teachers to benefit from these activities:

- National Training Teams (NTT)
- Provincial Training Teams (PTT)
- Senior Management Team (SMT)

- Staff Development Team (SDT)
- Development Support Group (DSG)
- Personal Growth Plan (PGP)

The effectiveness of the professional development presented to teachers can only be improved if all stakeholders in the education system realise the importance of teachers' engagement in effective professional development activities. Teachers could start by taking responsibility for their own engagement in professional development activities (Kempton, 2013). Coaching and follow-up sessions should also receive attention as ongoing feedback empowers teachers and builds confidence (Nishimura, 2014). Nishimura (2014) also mentions the benefits of planning for teachers' negative attitudes towards participation in professional development. The principal and SMT play a crucial role in teacher development as they can influence teachers' attitudes towards professional development and provide good quality opportunities to engage in professional development activities.

It is also important to thoroughly check and revise the quality of accredited professional development courses to ensure that they create opportunities for reflection and monitoring. The quality of forced collaborative activities, like cluster and PLC meetings, should be inspected, and the qualification and presentation skills of the presenters should also be examined.

Based on the findings of the study and on information about the educational value of professional development, recommendations for policy and practice and further research follow in Section 7.7.

7.7 RECOMMENDATIONS

In this section, recommendations are made based on the main conclusions drawn from this study. Recommendations for policy and practice are presented in Section 7.7.1 and recommendations for further research are presented in Section 7.7.2.

7.7.1 RECOMMENDATIONS FOR POLICY AND PRACTICE

When considering the results of this study, there are several recommendations for policy and practice. Since this study focused on teacher profiles and teachers'

participation in formal and informal professional development, the recommendations for policy and practice are presented for school management, as they should assist and monitor teachers in their engagement in professional development activities. The recommendations also concern teachers as they are primarily responsible for their own professional development.

7.7.1.1 Thoroughly explain SACE's CPTD system to novice teachers

As mentioned before, many teachers reported that they did not engage in professional development activities (DBE, 2018b). They also reported that they were not supported or monitored when participating in professional development activities (Bernadine, 2018; DBE, 2018b; Nel et al., 2016; Singh, 2011). This necessitates a thorough explanation of the CPTD system to especially novice teachers, although teachers with more experience could also benefit from updated knowledge. The importance of obtaining CPTD points should be highlighted (SACE, 2019b) and the different activity levels that teachers can engage in should be explained. However, this requires that the principal and SMT have adequate knowledge about the CPTD system. If necessary, SACE could present CPTD training at schools.

7.7.1.2 Professional development opportunities should be incorporated into the year plan of schools

In order to address the challenges that teachers experience with regard to their participation in professional development, professional development activities should be incorporated into the school's year plan (DBE, 2018b). If teachers are made aware of the activities beforehand and if the SMT selects activities that address contextual challenges and teachers' needs, the perspectives and attitudes of teachers towards professional development activities may change. If professional development activities are incorporated in the school calendar it would also assist the SMT to better monitor and support teachers when they participate in professional development activities.

7.7.1.3 Continuously evaluate the effectiveness of professional development that teachers engage in

Teachers' reports about their dissatisfaction with professional development activities (Govender, 2018; Mokhele & Jita, 2010), as well as insufficient monitoring and support

when teachers participate in professional development (Bernadine, 2018; DBE, 2018b; Nel et al., 2016) require that school principals and SMTs should continuously evaluate the effectiveness of the professional development of teachers (Gulston, 2010). It could be required of teachers to provide feedback. If a teacher experienced a professional development activity of poor quality, the service provider should be informed accordingly and suggestions for improvement should also be made. If necessary, the service provider could also be reported to SACE if the course standards are not up to date. Policy makers could further assess the standards of certain professional development activities for improvement (Darling-Hammond, et al., 2017).

7.7.1.4 Keep record of professional development at the school

The literature indicated that at various schools little evidence of professional development was available (DBE, 2018b). The principal should ensure that records are kept of the professional development that teachers attend, which could be made available to district officials if needed (Gulston, 2010).

7.7.1.5 Teachers should prioritise their own professional development

Teachers should make it a priority to engage in professional development activities of good quality (attend workshops, attend meetings, read) to better themselves. It is primarily the responsibility of the teacher to obtain the required CPTD points. Multiple teacher-initiated professional development activities are available (SACE, 2019c). If teachers experience a lack of support from provincial, district and school officials, they can use their own resources to take part in certain professional development activities.

7.7.1.6 Teachers should use the IQMS system as a tool for development

Teachers should view the IQMS system as a tool for development and not only as a means to comply with administrative directives. With the necessary monitoring and support, the SMT, SDT, DSG and PGP can help teachers to achieve their developmental goals. Hobson et al. (2012) stress the importance of mentoring novice and pre-service teachers. The mentoring of teachers could also include professional development activities that address the challenges faced by teachers, as well as feedback given by them.

7.7.2 RECOMMENDATIONS FOR FURTHER RESEARCH

7.7.2.1 Identify additional factors that could be considered as formal or informal professional development

Although the PIRLS Literacy 2016 teacher questionnaire addresses the issue of professional development, more detail regarding the type of professional development that teachers engage in, as well as their experiences with regard to these activities, are required. Additional indicators about South African teachers' participation in formal and informal professional development are necessary in order to obtain a better understanding of how teachers' participation in professional development could lead to improved learner achievement.

7.7.2.2 Explore the experiences of teachers with regard to professional development

Although professional development is addressed in the PIRLS Literacy 2016 teacher questionnaire, there is still insufficient information available about the effectiveness of the professional development of South African teachers as well as their experiences concerning professional development. The teacher questionnaire provided information about certain types of professional development that teachers engage in, as well as the time they spent attending these activities, but the effectiveness of the participation in these activities is not conveyed. Further research regarding teachers' attitudes towards participation in professional development could be conducted to establish ways in which teachers' attitudes can be positively enhanced and their views on participation in professional development improved.

Furthermore, a mixed-methods research approach could lead to a better understanding of teachers' qualitative experiences relating to their participation in professional development. It will also address challenges in an attempt to improve teachers' experiences and encourage better participation in professional development activities. Further research on teachers' experiences could also inform policy and improve the manner in which teachers' participation in professional development are monitored. It could also inform how to better support teachers on their lifelong learning journey.

7.7.2.3 Explore the relationship between specific teacher profiles and teachers' participation in formal and informal professional development

The PIRLS Literacy 2016 teacher questionnaire communicates the average amount of time that teachers spent on attending certain types of formal and informal professional development activities. Further research could be conducted among teachers with specific teacher profiles and how they participate in professional development activities. For example, it would be interesting to know whether older or younger teachers engage in more hours of professional development or whether qualified or under-qualified teachers spend more hours attending professional development activities. Management will be able to better support and encourage teachers to engage in professional development activities if they know the profiles of teachers who require professional development. In this way management could address the areas in which improvement is required.

7.7.2.4 Further explore the effectiveness of the manner in which teachers' participation in professional development is monitored by the DBE, provincial departments of education and district offices

The literature (Chapter 3) elaborated on the current situation of professional development in South Africa as well as the policies, programmes and initiatives implemented to monitor and improve teachers' engagement in professional development activities. Yet, the measures put in place are not adequately utilised and implemented as some teachers still feel that they do not benefit from professional development activities. They also feel that they are not supported or monitored when participating in professional development. The IQMS system mentions the National and Provincial Training Teams (NTT and PTT) (Education Labour Relations Council, 2003b), which could also be investigated to determine the effectiveness of these support measures. Further qualitative research could be conducted to establish how teachers are supported and monitored regarding their participation in professional development, specifically by the DBE, provincial departments of education and district offices. Such research could lead to improved policies and better monitoring of teachers, as well as support given to them by departmental officials.

7.7.2.5 Further explore the effectiveness of the manner in which teachers' participation in professional development are monitored by principals and SMTs.

The literature (Chapter 3) also specified mechanisms of support and monitoring used by principals and SMTs. However, it seems that principals and SMTs also find it difficult to support and monitor teachers when they participate in professional development activities. Further qualitative research could be conducted to determine how teachers are supported and monitored in this regard, specifically by principals and SMTs. Such research could lead to better policies. It could also lead to better monitoring and better support given to teachers by principals and SMTs.

7.7.2.6 Investigate ways to promote the effectiveness of professional development provided to teachers

Even though the literature (Chapter 3) indicates that various types of professional development activities are available for teachers (SACE, 2019c), these activities seem to be ineffective because they do not lead to improved learner achievement. Research on the effectiveness of professional development could identify both ineffective and effective professional development activities. Additionally, the characteristics of effective professional development activities could be utilised as guidelines for the improvement of other professional development activities.

7.7.2.7 Further explore specific professional development aimed at reading instruction

As reading is a specialised skill, further research about specific professional development aimed at teaching reading could assist in advocating for the importance of skill specific professional development opportunities. More opportunities for focussed professional development could lead to improved teaching of reading and better learner achievement results as well.

7.7.2.8 Further explore teachers' mother tongue as a part of teacher profiles to determine the association it has with learner achievement

The association teachers' mother tongue has with learners' reading literacy achievement can provide insightful information about instructing reading. Research on teachers' mother tongue could inform policy regarding the importance of language and reading being taught by a mother tongue language speaker. It would be interesting to

know whether learners' achievement results would improve when taught by a mother tongue language speaking teacher.

7.8 CONCLUDING THOUGHTS

This dissertation presented arguments concerning teacher profiles and especially the importance of teachers' engagement in formal and informal professional development activities and how these are related to South African Grade 4 learners' reading literacy achievement when controlling for the socio-economic status of learners. The study highlighted the importance of teachers' participation in formal and informal professional development and the role it plays in enhancing teachers' knowledge and skills to improve learner achievement.

The literature stressed the value of and the need for professional development, especially in South Africa's ever-changing educational community. However, the descriptive results as well as the standard multiple regression analysis showed no statistical significance between teachers' participation in professional development and learner achievement.

The fact that some of the results were statistically insignificant raised a question about the quality and effectiveness of professional development activities presented to South African teachers. The possibility exists that the PIRLS Literacy 2016 teacher questionnaire provided insufficient information regarding teachers' engagement in professional development. The effectiveness of the professional development opportunities provided to South African teachers could be addressed in future PIRLS studies.

The statistically insignificant results may further be attributed to ineffective presentation of, participation in, support of and monitoring of professional development initiatives in South Africa. However, various qualitative studies have reported on the educational significance of teachers' participation in professional development (Beckmann, 2018; Burroughs et al., 2019; Kang et al., 2013; Toropova et al., 2019; Wei et al., 2009), which could lead to enhanced teaching practices and improved learner achievement.

In conclusion, the following quote bears value:

"The most valuable resource that all teachers have is each other. Without collaboration our growth is limited to our own perspectives." – Robert John Meehan (Educator, author and poet).

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APPENDIX A

Appendix A presents a summary of the questions used as variables relating to teacher profiles from the PIRLS Literacy 2016 teacher questionnaire.

G1

A. By the end of this school year, how many years will you have been teaching altogether?

_____ years

*Please **round** to the nearest whole number.*

G3

A. How old are you?

*Tick **one** circle only.*

- Under 25 ---
- 25–29 ---
- 30–39 ---
- 40–49 ---
- 50–59 ---
- 60 or more ---

G4

A. What is the highest level of formal education you have completed?

*Tick **one** circle only.*

- Did not complete Grade 12/Standard 10 ---
- Grade 12/Standard 10 ---
- Post-secondary training (Vocational training, e.g. Teachers' College) ---
- Technikon diploma ---
- Bachelor's (first) degree ---
- Honours degree ---
- Master's degree ---
- Doctoral degree ---

APPENDIX B

Appendix B presents a selection of the questions used as variables relating to formal and informal professional development from the PIRLS Literacy 2016 teacher questionnaire.

G6

A. In the past two years, how many hours in total have you spent in formal professional development (e.g. workshops, seminars, lesson studies, etc.) that dealt directly with reading or teaching reading (e.g. reading theory, instructional methods)?

*Tick **one** circle only.*

- None ○
- Less than 6 hours ○
- 6–15 hours ○
- 16–35 hours ○
- More than 35 hours ○

B. Are you currently registered for a qualification which is related to your area of specialisation?

*Tick **one** circle only.*

- Yes ○
- No ○

G7

How would you characterise each of the following within your school?

*Tick **one** circle for each line.*

	Very high	High	Medium	Low	Very low
e) Collaboration between school leadership (including head teachers) and teachers to plan instruction	○	○	○	○	○

G9

How often do you have the following types of interactions with other teachers?

*Tick **one** circle for each line.*

	Very often	Often	Sometimes	Never or almost never
a) Share what I have learned about my teaching experiences	○	○	○	○
b) Observe another classroom to learn more about teaching	○	○	○	○
c) Work together to improve how to teach a particular topic	○	○	○	○
d) Work with teachers from other schools on the curriculum	○	○	○	○
e) Work with teachers from other grades to ensure continuity in learning	○	○	○	○
f) Set goals and monitor achievement	○	○	○	○
g) Share informational materials	○	○	○	○
h) Attend cluster meetings	○	○	○	○

APPENDIX C

Appendix C presents the questions from the school questionnaire added to the multiple regression model to control for learners' socio-economic background.