
Instructional leadership and academic performance: Eastern Cape educators' perceptions and quantitative evidence

DUMISANI HOMPASHE

Stellenbosch Economic Working Papers: WP13/2018

www.ekon.sun.ac.za/wpapers/2018/wp132018

July 2018

KEYWORDS: instructional leadership, principal-agent problem,
accountability, education production function, economics of education,
student achievement

JEL: I20, I21, I28

ReSEP (Research on Socio-Economic Policy)
<http://resep.sun.ac.za>

DEPARTMENT OF ECONOMICS
UNIVERSITY OF STELLENBOSCH
SOUTH AFRICA



UNIVERSITEIT
STELLENBOSCH
UNIVERSITY



A WORKING PAPER OF THE DEPARTMENT OF ECONOMICS AND THE
BUREAU FOR ECONOMIC RESEARCH AT THE UNIVERSITY OF STELLENBOSCH

www.ekon.sun.ac.za/wpapers

Instructional leadership and academic performance: Eastern Cape educators' perceptions and quantitative evidence

Dumisani Hompashe¹

ABSTRACT

This study aims to explore the experiences and perceptions of school educators on how school principals monitor curriculum delivery. It investigates the principal-agent problem and accountability in education in the Eastern Cape. Two types of data are used: qualitative data from interviews with school principals and teachers, and quantitative data from an international educational evaluation. The interview data were collected in 2015 at selected primary schools within three Eastern Cape education districts. Respondents at each school included the school principal and three foundation phase teachers. To triangulate findings from interviews, the association between school leadership and student academic scores in the Trends in International Mathematics and Science Study (TIMSS) 2015 dataset was examined for both Grade 5 and 9. The association between measures of instructional leadership (e.g. teachers' understanding of curricular goals and teachers' degree of success in implementing curricular goals) and student scores for mathematics and science was explored using linear probability models. Findings confirm the existence of the principal-agent problem in education, since many school respondents indicated that curriculum delivery monitoring was not conducted as expected. From the multivariate analysis, instructional leadership variables, such as teachers' understanding of curricular goals and teachers' degree of success in implementing the curriculum appear as important correlates of student achievement, though significance differs according to level of schooling and whether the questions were answered by principals or teachers. Policy implications point to a need to hire, empower and support principals to create a culture of accountability in schools.

Acknowledgements: This work is based on the research funded in part by the National Research Foundation of South Africa (Grant Number: TTK150605118774). Financial assistance from the Canon Collins Trust is also highly appreciated.

¹ Dumisani Hompashe. Research on Socio-Economic Policy at Stellenbosch University, Department of Economics; Lecturer at the University of Fort Hare, Department of Economics. Postal address: 52 Jay Avenue, King William's Town, 5601. Email: dhompashe@gmail.com

1. INTRODUCTION

South Africa lags far behind other countries on student achievement and even some upper-middle income countries in Africa, although the country spends more on education than its peers (Taylor, Van der Berg & Mabogoane 2013). Dysfunctional leadership in many schools may be an important reason for the low academic performance of South African students.

The main purpose of this research is to provide a qualitative account of one type of school leadership, in this case instructional leadership, in South African schools, as well as to present descriptive and multivariate evidence on the association between leadership quality and education outcomes across schools that participated in the Trends in Mathematics and Science Study (TIMSS) in 2015.

The South African Department of Basic Education's Action Plan to 2019 envisages school principals who ensure that teaching in the school takes place as expected and in accordance to the national curriculum (Republic of South Africa, 2015). The principal is also expected to have insight into "... his or her role as a leader whose responsibility is to promote harmony, creativity and a sound work ethic within the community and beyond." (Republic of South Africa, 2015:9). The National Development Plan (NDP) foresees a schooling system with highly motivated students and teachers by 2030. The NDP also envisages school heads who are effective in providing administrative and curriculum leadership at school (Republic of South Africa, 2011). In a nutshell, the principal's task is to ensure a good environment for teaching and learning in the school. The role of the principal as described in the NDP captures the main elements of instructional leadership, as defined in greater detail in section 2 below.

The theoretical framework of the current study is the principal-agent problem and accountability (Gailmard, 2014). Bruns, Filmer and Patrinos (2011) argue that incentive systems in education face a principal-agent problem that is prevalent in most sectors and firms. The authors state that in the education context, the principal might be the Department of Education who would like its agents (school principals and teachers) to implement the school's curriculum for learning to take place. However, due to information asymmetry and the nature of the education service, objectives of the principal and agents are not always synchronised. The principal-agent problem is further complicated due to the existence of multiple principals and multiple agents. On

the one hand, the department of education is also the agent of the parents and students, while on the other hand school heads act as principals to their teachers who are acting as the agents of the heads. Bruns et al. (2011) argue that this sequential set of principal-agent problems requires a more complex system of incentives and accountability than currently present in most school systems internationally.

In this study, we consider the senior officials as principals and the school heads as their agents. In the qualitative part of the study, we investigate the instructional leadership in selected primary schools in the Eastern Cape Province. More specifically, our objective is to gather experiences of principals and foundation phase educators on how instructional leadership is implemented across different types of primary schools in different social settings. Later, in the quantitative section we examine the association between leadership quality and education outcomes across schools that participated in TIMSS 2015.

We commence the study with a brief overview of South African literature on school leadership and management. Thereafter, we present international research on instructional leadership. We then discuss the research approach and method, data analysis and interpretation of results firstly for the qualitative part, before proceeding to the same for the quantitative part of the study. Lastly, we present our conclusions and recommendations.

2. LITERATURE REVIEW

2.1 Conceptualisation of instructional leadership model

Since the early 1980s, instructional models emerged from the research on effective schools (Hallinger, 2003; Robinson, Lloyd & Rowe, 2008; Hallinger & Heck, 2010). In an article that investigates the link between site-based instructional leadership and teachers' professional development, Graczewski, Knudson and Holtzman (2009) describe the traditional role of the principal as being that of focusing on administrative management activities, such as enforcing discipline and having good relations with the communities. The same authors point out that the instructional leadership paradigm emerged through the standards-based accountability framework in which United States school principals were compelled to take responsibility for the academic

performance of their students. The principal is no longer accountable mainly for inputs but is accountable for the performance outcomes of teachers and students (Pont, Nusche & Moorman, 2008). According to Elmore (2005) and Mulford and Silins (2003), school leadership should foster “organisational learning”. These authors describe organisational learning as the building of the school’s capacity for performance of high standard and continuous improvement through the professional development of staff, as well as creating a conducive environment for learning to take place. The focus of instructional leadership is on the role of the school principal who should coordinate, control, supervise, and develop curriculum and instruction in the school (Hallinger, 2003). Some of the other features of instructional leadership include the following:

- Instructional leadership means creating a conducive environment for teaching and learning to take place in pursuit of the academic and social school goals (Robinson et al., 2008).
- Instructional leaders should be goal-oriented and focus on the improvement of student academic achievement (Hallinger, 2003).
- Instructional leaders are also perceived as culture builders who create an ‘academic press’ which instils high academic expectations and standards among students and teachers (Mortimore, 1993).

Hallinger (2005) describes an effective principal as one who can find the correct balance among political, managerial and instructional roles. School leaders should be accountable to improve their schools and are expected to function as instructional leaders. Principals as instructional leaders should focus on coordinating and developing the curriculum (Hallinger, 2005) and pay more attention to creating a favourable teaching environment (Ruebling, Stow, Kayona & Clarke, 2004). Hallinger and Heck (2010) concur that school leadership should mainly direct its energy to improving student outcomes and the pursuit of other goals should be secondary.

There are various conceptual definitions of instructional leadership, but the model that this paper will focus on is that proposed by Hallinger and Murphy (1987). They suggested three dimensions for the instructional leadership role of the principal. The three dimensions are as follows:

- defining the school’s mission,
- managing the instructional programme, and

- promoting a positive school learning climate (Hallinger, 2005).

Each dimension consists of multiple variables or functions with potentially strong associations on student outcomes. For instance, the first dimension, defining the school's mission, incorporates two functions: framing the school's goals and communicating these goals. The second dimension, managing the instructional programme, contains three leadership functions: supervising and evaluating instruction, coordinating the curriculum, and monitoring student progress. And finally, the third dimension, promoting a positive school learning climate, consists of the following functions: protecting instructional time, promoting professional development, maintaining high visibility, providing incentives for teachers, and providing incentives for learning.

Several studies on school leadership look at how school leadership influences student learning. Studies on the effects of school leadership on student achievement vary between those that focus on a broad range of mediators (Robinson et al., 2008; Dong & Cravens, 2011) to those that specifically look at a narrow set of mediators to student learning (Leithwood, Patten & Jantzi, 2010; O'Donnell & White, 2005). In their review of 27 studies that investigated the impact of leadership on student outcomes, Robinson et al. (2008) highlighted five key dimensions of school leadership, of which they found only the dimension which promotes teacher development activities to have a relatively large positive association with student achievement. The other four dimensions included the following: establishing goals and expectations; resourcing strategically; planning, coordinating and evaluating teaching and the curriculum; and ensuring an orderly and supportive environment. It is also important to highlight that, in contrast to Philip Hallinger, (2005) who found a small but significant influence of principals on student outcomes, Robinson et al. (2008) found a substantial contribution of instructional leadership on student outcomes.

In a later study, Dong and Cravens (2011:86) explain the learning-centred leadership framework as comprising of six main components that are highly effective for student learning and achievement: holding high standards for student performance, a rigorous curriculum, quality instruction, a culture of learning and professional behaviour, connections to external communities, and systemic performance accountability. They further elaborate on three features of the learning-centred leadership framework (Dong

& Cravens, 2011:86). The first feature focuses on measurable “principal behaviours that are linked to teachers’ opportunities to improve instructional practices.” These exclude leadership aspects that are considered as prerequisites of leadership behaviours such as knowledge and skills, personal characteristics and beliefs. The second feature of the framework includes standards, curriculum, instruction, culture, external environment, and performance accountability. The third feature assumes that there exist aspects of the context within which leadership and schooling occurs that might moderate the impact of instructional leadership effects. Examples include systemic curriculum standards, experience of leadership, length of time in the same school, student body composition, staff composition, level of schooling and the geographical setting of the school.

Using Hallinger and Murphy’s (1987) Principal Instructional Management Rating Scale (PIMRS), O’Donnell and White (2005) found that teachers viewed the creation of a positive school climate by principals as the most important predictor of student achievement. However, results from their multivariate analysis indicated insignificant positive results regarding principal instructional leadership and students’ performance as perceived by both principals and teachers.

2.2 South African context

2.2.1 Education policy changes

Since the dawn of democracy in 1994 there has been considerable policy shift in school leadership and management in South Africa. The 1997 amendment of the South African Schools Act gave impetus to increased accountability in the delivery of education. The Act states that the principal has to account for the academic performance of students in the school (Republic of South Africa, 1996). In the area of school management, the Department of Basic Education (2015) notes some progress with regard to the attainment of this goal. The NEEDU report (2012) highlights an increase in the percentage of schools with improvement plans and class registers. However, several persons interviewed by NEEDU in most provinces expressed dissatisfaction with the time provided to implement the plans despite overall improvement in carrying out the plans. The increase in the number of schools with

improvement plans may merely indicate a rise in nominal compliance rather than an actual improvement in school management.

The transition from a racially divided education system to a unified non-racial one has significantly transformed the policy context for school leaders and managers (Bush, 2011). Ngcobo and Tikly (2010) note that since 1994, the South African government managed to put in place initiatives aimed at transforming education from its segregated past. Despite this, South Africa disappointingly lags behind in education performance relative to international comparators and has not succeeded in substantially improving the performance of historically disadvantaged students. School effectiveness studies (Taylor et al., 2013) also point out that students who attend historically white schools perform considerably better than their counterparts in historically black schools. A full transformation of the education system has thus not yet been achieved.

2.2.2 Reasons for poor academic performance

In a paper applying multivariate analysis to identify the factors associated with academic performance using NSES data, Taylor (2011) found that while school resource variables were not important correlates of student performance, indicators of effective school management were related to learning outcomes. At the same time the study revealed that South African schools differ greatly with respect to aspects such as good management practices, commitment of teachers, planning, teacher knowledge and curriculum coverage. Moreover, these factors are highly correlated to student achievement.

There are multiple reasons for the lack of responsiveness of the schooling system to various government reform efforts. Some of the reasons advanced by researchers include persistent shortages of physical and human resources, lack of professional training among educators (Jansen, 2005), socio-economic problems, family structure breakdown, poverty, vandalism and lack of respect for teachers (Kamper, 2008; Ngcobo & Tikly 2010; Jacobs, 2014). But there is growing evidence that systematic variation in school performance rather than poverty might contribute to low academic learning in historically disadvantaged South African schools (Van der Berg, 2007; Spaul, 2011). The latter researchers, using SACMEQ 2000 data and SACMEQ 2007 data respectively, found that poor South African children perform worse relative to

equally poor children in neighbouring countries. From their separate findings, the authors argued that there are factors besides poverty that might be preventing effective learning in historically disadvantaged schools in South Africa.

Using the National School Effectiveness Study (NSES) data in comparing curriculum coverage across historical parts of the school system, Taylor et al. (2013:67) found that "... weak instructional leadership and classroom practices ..." affect achievement among students in historically disadvantaged schools. In the NEEDU report (2013:19), instructional leadership features very strongly in the recommendations. It is phrased as follows:

It is the responsibility of the principal to lead curriculum delivery. While tasks and responsibilities should be formally distributed to members of the SMT and teachers, the principal must direct the overall strategy. A division of labour must be established within the school, with important tasks defined, planned and allocated to senior members of staff.

2.2.3 Principals and their role as instructional leaders

Some aspects of school leadership and management in South Africa, notably managing teaching and learning, remain inadequately researched. In her study on the labour market for South African principals, Wills (2015) reaffirms previous remarks by Hoadley, Christie and Ward (2009) that our school leadership research base is limited. Studies on instructional leadership seem to provide conflicting evidence regarding principals' understanding of their key role in promoting curriculum delivery in their schools. The NEEDU report (2013) which focused on 133 primary schools throughout the country, noted that generally principals were quite aware of the centrality of their responsibility and that of instructional leadership in leading the programme of the schools. However, the report noted that despite such awareness of the importance of instructional leadership, the schools' implementation of instructional leadership was not in line with policy as outlined in the curriculum and assessment policy statements (CAPS). In contrast, an earlier study by Hoadley et al. (2009), using data from a stratified sample of 142 high schools in the Eastern Cape and Western Cape provinces, found that principals understood their primary tasks as administration and chastising students. Principals were oblivious to the importance of their leadership role in curriculum monitoring. Another earlier study in Gauteng came to a similar

conclusion, as principals were shown to be ignorant of their role as instructional leaders (Bush & Heystek, 2006).

Bush and Glover (2016), in their review of literature on school leadership and management in South Africa, discern a rising recognition that instructional leadership might be a proper route to follow for school improvement in South Africa. Bush and Glover (2016) cite Robinson et al. (2008) who maintain that for school leaders to have a positive influence on student outcomes they should pay more attention to the core business of teaching and learning. This, according to Bush and Glover (2016), may be conducted through appropriate class visits, and phase and learning area discussions among educators. Other researchers (Taylor, Mabogoane & Akoobhai, 2011) highlight, more specifically, instructional time management as an important aspect of instructional leadership. These researchers note inefficiencies in the way time is utilised in many of South African schools. This manifests at three levels, namely: arriving at school, getting to class, and covering the curriculum while in class. In their mixed method study undertaken in high schools from the Eastern Cape and Free State provinces, Taylor et al. (2013) found the prevalence of weak management practices together with very low levels of teacher subject knowledge and destructive union activity. An earlier study (Chisholm et al., 2005) commissioned by the Education Labour Relations Council concluded that there was a gap between policy and practice when comparing hours that educators spent on their different activities to that recommended or implied by national policy. The study found that South African educators spend far less time on actual teaching than the amount of time specified in policy.

2.2.4 Managing instructional time

In their review of education studies on developing countries, Glewwe & Muralidharan (2016) maintain that the high rate of teacher absenteeism contributes to poor school and teacher governance in developing countries. Several South African studies (Carnoy & Chisholm 2008; Reddy et al., 2010; Moletsane et al., 2015) have found that less than half of the officially scheduled lessons are taught. In their study, Carnoy, Chisholm and Chilisa (2012) evaluated 58 schools in the North West province and 58 schools in Botswana, and found that Grade 6 teachers in North West had only taught 40 percent of the scheduled lessons by the beginning of November, while their

counterparts in Botswana taught 60 percent of the lessons. In the same study, it was found that principals from North West did not have a problem with teacher absenteeism, but rather noted that in most cases where teachers were present in school, they failed to teach students due to lack of confidence in their Grade 6 mathematics content.

In a study by the Human Sciences Research Council commissioned by the United Nations International Children's Emergency Fund (UNICEF) on behalf of the Department of Education, Reddy et al. (2010) argue that the time spent on teaching and learning activities in school is among the reasons for low quality education provision in South African schools. They found that the leave rate of teachers in South Africa was between 10% and 12%², which translates to 20 to 24 days out of the official total of 200 school days. In its literature review, this study additionally found that in high-income countries' teacher absence rates were between 3% and 6% and that there was a system of substitute teachers to compensate for teacher absence (Reddy et al., 2010). Contrary to this, most less developed countries did not have provisions for substitute teachers and in these countries, teacher absence rates averaged at 19%.

The Employment of Educators Act 76 of 1998 stipulates that educators are regarded as being on annual leave during the institutional closure periods that are outside of scheduled working time. The exception is when the educator is required to perform some of his or her normal duties (such as preparation for the new school term or marking of internal examination scripts). It should be noted that in South Africa educator leave policy is not clear as to the acceptable number of days educators may be absent from school, but there is general agreement that 10% should be used as a benchmark (Republic of South Africa, 2013a). Moletsane, Juan, Prinsloo and Reddy (2015) point out that while educators' leave policies are meant to enhance teachers' conditions of service, their objective is also to safeguard the rights of students to good quality education by ensuring that teachers remain on task, and that teaching and learning is not disrupted. This means that the principals are duty-bound to ensure that

² The Human Sciences Research Study defines educator leave as including the following leave categories: (i) times taken according to leave measures; (ii) when educators are on duty but away from school attending professional development workshops; and (iii) when educators participate in school activities like sports, excursions and festivals.

while promoting teachers' conditions of service, they at the same time do not deprive students of their right to education.

A survey of 2005 schools conducted by Social Surveys on behalf of the Department of Basic Education found that nationally 6.1% of educators were absent on an average day, with the highest absentee rate in KwaZulu-Natal at 8.2% (Republic of South Africa, 2013a). This finding means that educators on average were absent for 12 teaching days per year in South Africa. This refers to those educators who had not signed the educator leave register and are not in school due to ill-health, attending to family matters or studying. Other related findings of the survey include the following:

- High vacancy levels in permanent teaching posts in some provinces.
- A low percentage of schools that cover the required number of language and mathematics exercises per week in all provinces.
- A low number of visits by district officials for monitoring and support purposes in the Eastern Cape schools – 74% compared to the national average of 87%.
- Low satisfaction among principals with the district support services.

2.3 Summary

The South African literature above is suggestive of the elements that should comprise the line of enquiry of the current study. The first element is instructional time and this has been highlighted in a number of studies (Taylor 2013; Reddy et al., 2010; Republic of South Africa, 2013; Chisholm et al., 2005). The second element is the role of principals in curriculum monitoring which has also been tackled by several studies (NEEDU 2013; Hoadley et al., 2009; Bush & Glover, 2016). Other elements from the literature include teacher union activity (Taylor et al., 2013) and managing teacher vacancies (Republic of South Africa, 2013a). These factors have been incorporated in the design of the qualitative aspect of the present study. Some factors have also been included in the quantitative part of the study, where the data allowed.

3. STUDY CONTEXT

The Eastern Cape is primarily a rural province, characterised by high levels of unemployment and illiteracy (ECDOE, 2015). Among the features of the province

resulting from the legacy of apartheid are glaring disparities in infrastructure. These disparities are more pronounced in the eastern part of the province. The Eastern Cape Department of Education (ECDOE) (2015) describes the eastern part of the province as more economically impoverished with a terrain that makes its accessibility to services far more difficult than in the western part. The skills profile of the province is also affected by migration to other regions, evidenced by the low nominal growth of population in the 20-49 year group. This is the economically active age group that typically moves to other areas in search of job opportunities. Even within the Eastern Cape, there is evidence that the population is slowly moving into the 60-100km-wide coastal belt, a more economically active area, which now contains almost half of the provincial residents.

Over a long period, the education administration of the province has been confronted with major challenges, despite an overabundance of national interventions that even includes the implementation of Section 100 (1) (b) of the Constitution at one stage. This section allows the national executive to take over the responsibility of education delivery, following provincial authorities' failure to do so. Section 100 (1) (b) was implemented with effect from March 2011. It is not clear when the section was lifted, but according to the National Department of Basic Education, it still applied during 2016. The administrative leadership of the provincial education department acknowledges that the department is faced with "a deep-rooted discord between policy intentions and policy implementation, resulting in failure to meet minimum norms and standards in the delivery of education services." (ECDOE, 2015:55). The current acting head of the department, Ms Sizakele Netshilaphala, noted that the dire state of affairs in the department is associated with a lack of policy implementation and a problem of dysfunctional schools (Nkosi, 2015).

3.1 Socio-economic status of the province

As alluded to above, the Eastern Cape province is characterised by high levels of unemployment, poverty, illiteracy and infrastructural backlogs. From the National Education Infrastructure Management System³ (NEIMS) indices such as the socio-economic deprivation index (SEI), composite infrastructural index (CII) and composite

³ The NEIMS is a database of public schools derived from the first infrastructure survey (School Register of Needs – SRN) conducted in 1996 and updated in 2000.

services index (CSI), it emerges that a significant number of the worst performing education districts are from the eastern part of the province. All these indices were constructed based on the 2011 Census (Republic of South Africa, 2013b). Table 1 shows the performance of the 23 education districts in the Eastern Cape regarding the above indices. From the table, education districts situated in the eastern part of the province (Cluster⁴ A and B) are worse off than those situated in the western part of the province (Cluster C). This picture depicts the legacy of apartheid where areas situated in the former homeland⁵ of Transkei, based in the eastern part of the province, experienced greater poverty and deprivation.

The eight poorest education districts in the country in terms of ranking on the socio-economic index, with high levels of functional illiteracy, low income per capita and fewer households with electricity, are all situated in the eastern part of the Eastern Cape, either in cluster B or C (as provided in Table 1). Again, the six districts with the worst infrastructure and access to household services are also found in the eastern part of the province. This pattern also holds for school districts with the highest proportion of students studying in quintiles 1 and 2 schools (the poorest schools). Out of 86 education districts in the country, six of the 10 districts with the largest proportions of poor students (those attending quintile 1 and 2 schools) are in the Eastern Cape. The remaining four (out of 10) districts are in KwaZulu-Natal (two), Limpopo (one) and Mpumalanga (one) (Republic of South Africa, 2013b).

⁴ The 23 education districts are demarcated into three clusters, namely clusters A, B and C. Included in clusters A and B are districts situated in the former Transkei, while Cluster A consists of districts situated in the former Ciskei and those that were managed by the Department of Education and Training.

⁵ A homeland or a Bantustan was a territory set aside for black people as part of the policy of apartheid.

Table 1: Eastern Cape education districts per socio-economic status

Cluster	Education Districts	Socio-economic Index ⁶ (0=most poor)	Composite Infrastructural Index ⁷ (0=worst)	Composite Services Index ⁸ (0=worst)
A	Libode	0.21	0.17*	0.11*
	Lusikisiki	0.09*	0.11*	0.05
	Maluti	0.18*	0.27	0.26
	Mbizana	0.15*	0.12*	0.07*
	Mount Fletcher	0.11*	0.19*	0.25
	Mount Frere	0.20*	0.19*	0.19*
	Qumbu	0.30	0.08*	0.20*
Average		0.18*	0.16*	0.16*
B	Butterworth	0.27	0.22	0.24
	Cofimvaba	0.18*	0.33	0.19*
	Dutywa	0.07*	0.26	0.07*
	Lady Frere	0.25	0.27	0.34
	Mthatha	0.36	0.35	0.39
	Ngcobo	0.17*	0.27	0.25
	Sterkspruit	0.37	0.52	0.58
Average		0.24	0.32	0.29
C	Cradock	0.47	0.62	0.82
	East London	0.57	0.86	0.78
	Fort Beaufort	0.47	0.43	0.59
	Graaff-Reinet	0.49	0.75	0.88
	Grahamstown	0.53	0.62	0.84
	King William's Town	0.50	0.64	0.58
	Queenstown	0.52	0.57	0.78
	Uitenhage	0.59	0.85	0.88
Average		0.53	0.70	0.78

Source: Republic of South Africa 2013a

⁶ The socio-economic deprivation index for education districts combines various social and economic criteria from the 2011 Census. The following criteria were used to create the index. 1. Functional literacy, i.e. the percentage of adult population that has attained at least Grade 6 schooling divided by the total number of adults (aged 20 and above). 2. Per capita income, i.e. total monthly income divided by the total population. 3. Percentage of household with electricity (supplied by Eskom or a local municipality) (Republic of South Africa, 2013b).

⁷ Composite Infrastructural Index is composed of percentages of schools with access to water, electricity, fencing and gates, schools with sewage disposal, schools with flushing toilets.

⁸ Composite Services Index was created using data from Census 2011. Four variables were used to construct the index, namely: type of toilet facility, sources of water, refuse disposal method, and type of energy used for cooking (Republic of South Africa, 2013b).

3.2 Educators' profile

In addition to the structural resources referred to above, the quality of education is also dependent on other school resources, such as student-educator ratios (LERs), teacher qualifications and experience, as well as other factors, including the availability of learning materials, level of organisation of the school (timekeeping, management, etc.), the socio-economic background of the students, and motivation of the teachers. The student-educator ratio refers to the average number of students per educator. The lower this number, the better the potential quality of education, since contact time can be improved and learning enhanced. The student-educator ratios for education districts include educators appointed by School Governing Bodies (SGBs) (Table 2). From the information in the table it can be concluded that there is substantial intra-provincial variation in student-educator ratios, with the highest ratios found in the Libode, Lusikisiki and Mbizana education districts.

Table 2: Eastern Cape education district student-educator ratios, 2012

Student-educator ratios	Education districts
22 – 25	Butterworth; Cofimvaba; Fort Beaufort; Grahamstown; King William's Town
26 – 28	Cradock; Dutywa; East London; Lady Frere; Mt Fletcher; Port Elizabeth; Queenstown; Qumbu
29 – 30	Maluti; Mt Frere; Ngcobob; Sterkspruit; Uitenhage; Mthatha
31 – 33	Graaff-Reinet
34 – 36	Libode; Lusikisiki; Mbizana

Source: Republic of South Africa 2013b

In South Africa, the qualifications of educators range from REQV 10 (matric, no-training) to REQV 17 (matric + 7 years of training). The lowest REQV (REQV 10) represents unqualified educators, while educators with REQV 11-12 are regarded as underqualified. To be fully qualified to teach in South Africa an educator must have REQV 13 and above. These higher REQVs denote that the educator has completed Grade 12 and has attained three or more years of tertiary study. In 2012, the Eastern Cape had a mere 1% of educators who were unqualified and underqualified by these

criteria, while the proportion of educators who were qualified (REQV 13) and well qualified (REQV 14-17) was 29% and 69% respectively. Thus 98% of educators met the minimum qualification standard. The districts with higher proportions of well-qualified educators were more urban and densely populated ones, i.e. Port Elizabeth, Grahamstown, East London and Mthatha. This indicates that generally, educators in the Eastern Cape are considered well qualified to teach, based on formal qualifications (Republic of South Africa, 2013b).

Regarding the average age of educators, the western part of the province is characterised by older educators, with Graaff-Reinet being the education district with the highest average educator age at 50.1 years. In contrast to this, the educators in the more under-developed eastern part of the province are relatively younger (Republic of South Africa, 2013b)

In the following section, we describe the data collection for the qualitative part as well as the dataset for the quantitative part of the study.

4. PERCEPTIONS FROM EASTERN CAPE EDUCATORS

This section provides a description of the data, method, ethical clearance and findings for the qualitative part of the study.

4.1 Data collection

The main part of this study is based on structured, in-depth interviews with the focus on investigating the underlying processes of instructional leadership within the context of the South African schooling system. The rationale for including a qualitative component is that previous research in South Africa has mainly focused on quantitative analysis.

We interviewed a total of 15 principals and 42 foundation phase primary teachers at 15 primary schools in three selected districts of the Eastern Cape. The target was to interview 15 principals but at one school we interviewed a head of department (HOD) who was an acting principal in the school, and at another school in the same district, the principal was not at the school and consequently we interviewed a HOD. Since HODs are also in the school management teams, they are assumed to be familiar with the leadership and management responsibilities of the principals, and therefore this

should pose no problem for the quality of the data obtained. The involvement of different individuals per school provides for data verification and triangulation of responses to questions regarding the management of the curriculum (Hoadley *et al.*, 2009).

We purposively selected 15 primary schools based on several criteria, including academic performance, socio economic status, and cultural environment. The criteria were used to obtain a balanced sample of schools across academic performance. We used the annual national assessments (ANA) Grade 6 results for 2013 to determine academic performance of schools. This is consistent with Taylor *et al.*, (2013), who used ANA test scores for 2010 to identify two pairs of schools in rural KwaZulu-Natal and rural North West. In selecting the schools, convenience sampling was used. For instance, we selected schools in districts in such a manner that it would reduce transport costs and time for data collection. Moreover, we had well-established contacts with the districts in which the schools were located.

We collected data through a vignette integrated into an interview guide, along with open-ended questions about the case of a poorly-managed school in a rural South African context. Vignettes are defined as "... short stories about hypothetical characters in specified circumstances to whose situation the interviewee is invited to respond ..." (Finch, 1987:105). A vignette, therefore, is a useful research instrument in cases where the interviewees may be reluctant to disclose information about their conduct and viewpoints (Gourlay *et al.*, 2014). Research on how school principals lead and manage teaching and learning is a sensitive topic and it is assumed that some principals and teachers may not be willing to reveal the truth about their specific school situations. Vignettes may assist in eliciting more truthful responses from school principals and teachers. The vignette is based on a rural primary school principal whose school is characterised by low student numbers, a high rate of absenteeism and late arrival at school among both teachers and students (see Appendix A for the full vignette). The academic performance of students at this hypothetical school is very weak as reflected in the annual national assessments results for the past three years.

The semi-structured format of the interviews enabled interviewers to use prompts to explore issues more deeply wherever necessary. Interview questions for both principals and teachers were focused on respondents' perceptions of leadership in curriculum delivery, as well as matters relating to managing the school's instructional

time. In addition to these broad themes, the interviews also sought basic information statistics such as enrolment, class sizes, teacher-pupil ratios, teaching qualifications, and teaching experience to account for school context. In this regard, photographs of the schools, copies of documents such as attendance registers, time-table, and teachers' work programmes were gathered, and there were unstructured observations of the schools' culture and climate.

Before we asked the questions, we provided each participant an extract to read. The first set of questions was directly based on the extract where the participants were asked what they think the character in the vignette should do to address the problems in her school. Thereafter, we asked questions specific to the contexts of the respondents' schools and we also asked the respondents to provide answers about their own conduct and experiences.

The interviewed school districts are in East London, Fort Beaufort and King William's Town. As a departure from other earlier South African case studies on instructional leadership at schools that focused on schools serving very poor communities (Malcom, Keane, Hoohlo, Kgaka & Ovens, 2000; Christie, Butler & Potterson, 2007; Taylor et al., 2011), this study is based on schools that serve communities of different socio-economic statuses within a single province. The selected schools differ in the following respects: enrolment and number of staff; student performance; former education departments; socioeconomic conditions; cultural environment; and political economy. For instance, some schools are former Model C⁹ schools, others are based in black and coloured townships, while still others are drawn from rural areas. Four of the schools are quintile¹⁰ five schools (richest group of schools), one is quintile four and the rest belong to quintile three. The selected schools are all administered by a single provincial Department of Basic Education (ECDOE) and they are all monograde schools.

⁹ These are government schools that are partially administered and funded by parents and a governing body. During apartheid, these schools were known as "Model C" schools and the name has stuck since then.

¹⁰ The classification of schools according to quintiles is based on the Norms and Standards for school funding of 1998, which required provincial education departments to rank public schools in their jurisdictions into five quintiles according to the resource targeting table (RTT). This categorisation was based on two criteria, namely: the school's physical or poverty condition and the relative poverty of the school (Pampallis, 2008: 12; Madubula, 2008:127).

We visited the schools in August and September 2015 after obtaining permission from the Eastern Cape Department of Education and the respective district heads. We interviewed all the principals (except for the two schools in which HODs were interviewed) and the foundation phase teachers in the sample schools individually.

4.2 Data analysis

We followed a theoretical thematic analysis approach in analysing the data. A theoretical or deductive thematic analysis, in contrast to an inductive approach, tends to be driven by the researcher's theoretical interest in the area (Braun & Clarke, 2006). This implies that the coding of data has been tailored for specific research questions.

During the data collection stage, we took notes during the interviews and recorded all interviews on tape. As the interviews progressed we transcribed the data into written form to conduct a thematic analysis. The transcription assisted in getting more familiar with the data. During this process, there was repeated reading and listening as a way of searching for meanings and patterns. We conducted all the transcriptions, and for accuracy we went through the recordings again.

Having transcribed the data, we used computer-assisted qualitative data analysis software - NVivo 11- to analyse it. NVivo is a qualitative analysis software appropriate for use in situations where the researcher has substantial amounts of qualitative textual, audio and visual data. Among the benefits of NVivo are that it assists with the development of consistent coding schemes and that comparison can be made between coded elements (Robson, 2011).

Coding in NVivo is done by tagging and naming selections of text within each data item. During the initial coding process, the whole data set was given equal attention so that full consideration could be given to repeated patterns within the data.

After the initial coding had been done, we sorted the different codes into themes. This enabled putting all the relevant coded data extracts within identified themes. There are six broad themes under which different codes were grouped (Figure 1). Some of these themes have been broken down into sub-themes.

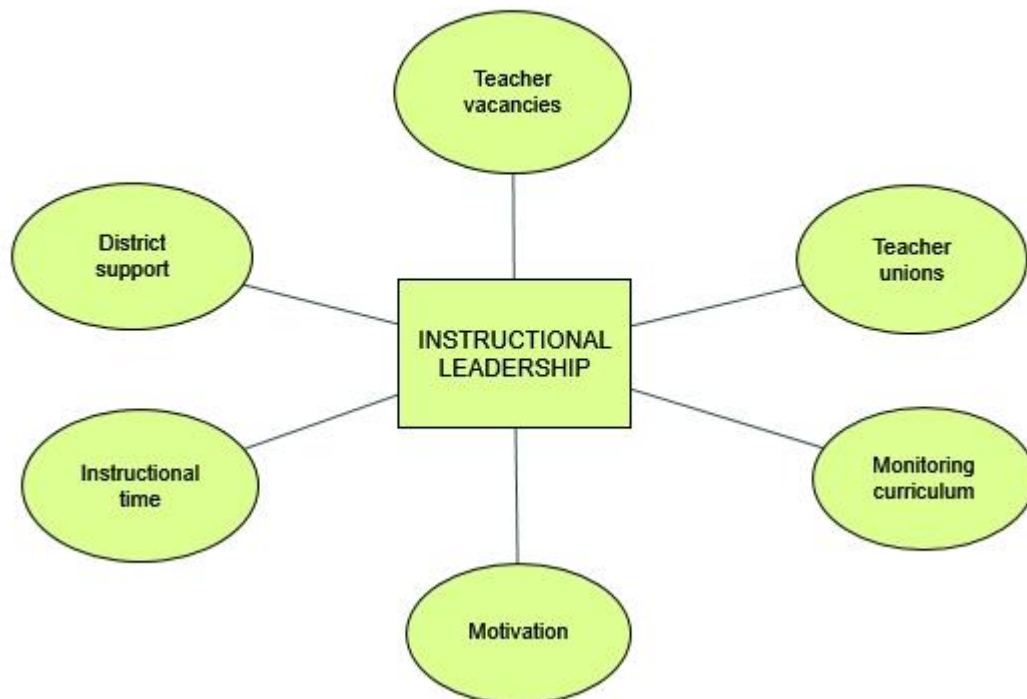


Figure 1: Thematic map

As mentioned, data analysis was informed by the research literature and the research questions.

4.3 Ethical clearance

The study was approved by the ethics committee of Stellenbosch University (DESC/VanderBerg/Jul2015/3) and the ECDOE provided permission to interview respondents in the selected 15 primary schools. We also received permission from the district directors at the three education districts. Written informed consent was obtained in English for all respondents in the study and before each interview verbal consent was granted for the tape recording of the interviews.

4.4 Research findings

In this section we first discuss the composition of the sample of schools interviewed. This is followed by a discussion of findings. The findings are discussed based on the six broad themes shown in the thematic map in Figure 2.

4.4.1 Sample composition

A summary of the demographic composition of the sample is provided in Table 3. The sample consisted of eight (8) township schools, four (4) rural schools and only three (3) suburban schools (Table 3). Most of the schools interviewed (10 schools) were from quintile three, and the sizes of the schools were fairly spread from medium to very large, with only one small school in the sample. It is also remarkable to note that only four out of 15 schools in the sample were headed by female principals.

Table 3: Composition of the sample of schools

	Rural schools	Township schools	Suburban school	Total
	4	8	3	15
	Quintile 3 schools	Quintile 4 schools	Quintile 5 schools	Total
	10	1	4	15
Small schools ¹¹	Medium schools	Large schools	Very large schools	Total
1	5	4	5	15
		Female-headed	Male-headed	Total
		4	11	15

Source: Author's own calculations from interview data

4.4.2 Instructional time

The literature indicates that the overall management of teaching and learning is crucial for South African principals (Wills, 2015). As discussed, the role of principal includes creating an environment for effective teaching and learning to take place, including putting in place some organisational aspects needed for effective teaching and learning to materialise. Some organisational aspects, such as the management of instructional time, are vital in 'creating organisational containment and establishing expectations around good quality teaching within the school' (Bush, Joubert, Kiggundu & van Rooyen, 2010: 378).

The research shows that principals have a restricted role in managing instructional time. Generally, most principals reported that teacher attendance in their schools was good and manageable. There were some instances where a teacher would be absent

¹¹ School sizes as determined in the National Minimum Norms and Standards for School Infrastructure (2009). A small school has a minimum of 135 students and a maximum of 320 students; a medium school has a minimum of 321 students and a maximum of 620; a large school has a minimum of 621 students and a maximum of 930 students; a very large school more than 939.

for one or two days, but that was considered normal. For this study, 'absent' refers to those educators who are not at school as a result of sick/temporary incapacity leave, annual/compassionate/family responsibility leave, or study leave. However, some school principals admitted that they experienced problems regarding attendance by teachers. In addressing teacher absenteeism, one school principal reported that as a school they have adopted a policy where teachers would pay somebody from the community to act as a substitute during a teacher's absence. This practice was used in one other school, and both principals commended this policy, stating that it was effective in curbing teacher absence. It should be noted that in the rest of the schools there was no system of replacement teachers. During a teacher's absence, the burden was on the remaining teachers who teach the same grade to look after students whose class teacher is absent.

Some of the reasons cited by both principals and teachers for teacher absence include sickness, family responsibility, and examinations. Several principals pointed out that, except for sickness, other types of absence are planned. In terms of the Employment of Educators Act 76 of 1998 (Department of Education, 1998), family responsibility leave is granted in cases where "an educator's spouse or life partner gives birth, the educator's child, spouse or life partner is sick, the educator's child, spouse or life partner dies or the educator's immediate family member dies".

Based on the vignette they were requested to read, respondents were asked the following question: *What do you think Mrs Banayi, the principal, should do to curb teacher and student absenteeism?* A variety of responses were provided by participants to this question. The responses are organised into the following sub-themes: meeting and talking with teachers; meeting with parents; motivating teachers and parents; and implementing leave policy.

Meeting and talking with teachers: Several respondents, mostly teachers, cited the need for the principal to convene meetings with teachers to discuss the problem of absenteeism. It is at such meetings that solutions can be found. Even consultations with individual teachers have been highlighted as a good way to instil confidence among teachers. A teacher from a King William's Town school stated that the principal should remind teachers that they are role models to the children. The importance of convening meetings with teachers to find solutions to the problem of absence from school was also cited by 47% of headmasters. The headmaster of EL3 pointed out

that the principal should “sit down with teachers and talk to them” to address the issue of teacher absenteeism. Another headmaster had the following to say:

She must sit down with the teachers and talk with them around this issue of distance. They are residing very far from the school, and she must find out from them how they are going to make it in order that they are punctual at school.

From the interviews it is evident that school principals do not implement any disciplinary actions against their teachers. As in Vawda (2011), the schools addressed teacher negligence informally through meetings with the perpetrator with the hope that this would change his/her behaviour.

Convening meetings with parents: A small percentage of respondents (20%) cited the importance of convening meetings with parents. The respondents highlighted that parents need to know the activities of the schools and they ought to support the principal in directing the school in the right direction. For instance, the principal of EL1 stated that the principal should convene parents’ meetings to explain the crucial importance of education.

Enforcement of school leave policy: There were some headmasters and teachers who were of the view that a more formal-rule-bound approach was needed to improve the culture of teaching and learning. They said that the headmaster needed to be a bit more authoritative and enforce the school leave policies. A teacher from one of the schools said that:

The principal should use the school policy since it covers things like school working times. If a teacher is absent, there should be a concrete reason, like if someone is not well he/she should submit a doctor’s certificate.

Punctuality of teachers and learners: Late-coming in South African schools is a widespread problem. Findings from the NEEDU report (2014) describe a dire situation in which in more than half of FET phase schools sampled and more than 98% of senior phase schools sampled teachers were always and often arriving late at school. Gustafsson (2007) cited teacher late-coming as a problem in 96% of South African historically disadvantaged schools and 36% of historically advantaged schools, and

he inferred that late coming by teachers was linked to students' academic performance. Gustafsson's (2007) finding is based on his analysis of the SACMEQ 2000 dataset in which the teacher late-coming variable was based on a question which asked the school principal about the frequency of teachers' late-coming.

When asked about punctuality, both principals and teachers provided mixed responses. Generally, most respondents indicated that teachers were always punctual, while the problem was with students. It is only in a few schools that both teachers and students were said to be always punctual, and this is due mainly to proximity on the part of students, as well as the availability of scholar transport for those who stay far. Some principals cited the signing of the school attendance register as effective in promoting early arrival by teachers. One principal reported that previously he had to lock the gate so that teachers and students who were late remained outside for some time. This is what the principal said about this:

I was mentioning embarrassment ... close the gate ... and the teachers stand with the children who are late ... it will happen once or twice but not the third time. I'm talking about experience now ... we did it and there was a change.

There were principals who appeared to have no strategy to deal with teacher punctuality. For instance, one principal pointed out:

You get a certain percentage of educators – about 3% – who are constantly late. You speak to them, you try to be collegial, you don't want to take the route of the book and the teacher lands in trouble, so you reason with that teacher, but sometimes you see that your efforts are in vain, with some of them ...

In another school, the principal attributed the problem of late coming-of teachers to public transport. The school is situated in a rural area and most teachers stay far away in towns and some are dependent on public transport to attend school.

4.4.3 Teacher motivation

Teacher motivation cannot be substituted by any amount of training or inputs (World Bank, 2018). To achieve a specific goal, everyone requires motivation (Heystek,

2015). When there is no accountability to provide motivation, teachers may shirk their responsibility by providing less effort (World Bank, 2018).

In 2003, the South African Department of Education introduced the Integrated Quality Management System (IQMS), an appraisal instrument meant to develop competencies of teachers and to improve the quality of education (Heystek, 2015; Nkonki & Mammen, 2012).

The interviewed principals and teachers were critical about the role of IQMS in motivating teachers and improving the quality of education. From their responses it was evident that IQMS was implemented for salary progression by schools, and the developmental function was ignored. Several principals admitted that the performance management system is not done properly because teacher don't want lower scores. One principal captures this sentiment as follows:

As a person I am having a problem when they attach money to IQMS. One is always tempted to go for money and not development. If you talk about development you are supposed to put development on its own as a programme and not assign incentives to it.

This view is reiterated in the following extract by another principal:

I don't think it is particularly successful generally across the board. I think it's quite a difficult method of assessing people, especially when you got money attached to it. I don't know how honestly, it's done across the board.

In its design the IQMS policy combines the aspects of accountability and professional development. Despite an emphasis on accountability, the quality management system has not been able to hold teachers accountable for the quality of their performance, as measured by students' achievement in tests and examinations. Moreover, there has been no disciplinary or corrective action taken in instances where there was poor performance (Heystek, 2015; Mosoge & Pilane, 2014).

However, a few principals and teachers considered IQMS as having a positive contribution to teachers' motivation. One principal stated that even though teachers focussed on the financial aspect of the evaluation, the system helps in motivation since teachers are aware that someone else is watching them to check on quality teaching. This resonates well with one of four mechanisms of motivation mentioned in Lerner and Tetlock's review that the mere awareness that another person is watching makes one feel accountable and motivated (Gill, Lerner & Meosky, 2016). The preceding

discussion suggests that despite weaknesses of the IQMS, the education system cannot afford to do away with it but should find ways to improve it.

Besides the policy espoused in the IQMS principals are supposed to create a positive climate “in which ongoing personal and professional development is encouraged and supported and in which the potential contribution of everyone is valued” (Department of Basic Education., 2014:7). One of the eight key areas of principalship *‘Developing and empowering self, others and wellness of the staff’*, clearly spells that the principal should know about mechanisms in which s/he can motivate and boost the morale of her/his staff members (Department of Basic Education., 2014).

When asked whether their teachers are motivated or not, most principals (nine out of 15 interviewed) said that they think their teachers are motivated. Two principals described at length the strategies they use to get their staff motivated. These strategies involved the creation of a good environment for the staff to be happy. In these schools, teachers are sent to courses or workshops on various aspects of schooling, including information technology, discipline, administration or specific school subjects. Moreover, according to the principals, these schools are characterised by having staff outings where staff members are encouraged to have fun. One principal had this to say on teacher motivation:

One of my first jobs is to make sure they've got a friendly and safe environment to work in and to keep them motivated, that's my job. I enjoy praising them and make sure I know what they do, so when they do it, I give them acknowledgement for that.

However, other school principals highlighted several problems that make their teachers feel unmotivated. These include high teacher workload due to understaffing, redeployment, class sizes, lack of individual attention, ill-discipline among students and lack of support from the Department. One principal was very critical of class size, especially in the case of class size in dual-language medium schools. In these schools, there is often a large disparity in class size between the same grade classes for different languages. He cited a case where there was a total number of 100 learners and three teachers in Grade 5, where two Afrikaans classes have 40 students each,

and the English class had only 20 students. The official student teacher ratio of 35:1 was thus not reached in any of these classes.

The issue of teacher redeployment¹² can also be experienced as demotivating by teachers. On teacher redeployment one of the principals said the following:

The problem of redeployment is tampering with the welfare of educators. You are not certain of what is going to happen tomorrow, so redeployment is not good. Although it helps the department in terms of finances, it affects the educators. Today I am here, tomorrow I don't know where I am going to be.

When participants were expressing their opinions on teacher and student absence, the themes of motivating teachers and parents came out very strongly, especially from the principals. A substantial number of principals felt that to improve the situation in the school the principal should motivate her teachers (vignette scenario). One principal stated his opinion as follows:

I think she as the headmaster should motivate her teachers ... possibly change the focus that they have to the children, because they are the most important folk in this whole setup ...

Some respondents suggested ways to motivate the teachers, ranging from teacher awards to motivational workshops. For instance, one school headmaster said:

... you'll have to start with the teachers, maybe a motivational workshop can do things ... there is no quick fix in things like this ... it comes with hard work and leading by example.

Some principals also felt that for improvement of the school, the parents of the children should be on board. The principals as the school leaders should strive to win the support of the parents. In illustrating this, one principal said that:

... it doesn't matter whether it is rural or urban, if I was that principal I would get the parents behind me so that they support me in redirecting that school towards the right direction.

¹² Teacher redeployment is a rationalisation system based on the redistribution of posts to schools. Schools with lower student numbers are allocated fewer posts while those with higher number get more posts, and this leaves some schools with excess teachers who should move to schools where there is shortage of teachers.

And to achieve that, a substantial number of headmasters agreed that parents need to be motivated. They should be made to appreciate the value of education for their children.

Overall, the responses from the interviews indicate that principals are mindful of their role in motivating their staff members and are fulfilling the responsibility in various ways, despite some challenges emanating from different contexts. Sending teachers to professional development courses and workshops resonates with one of their key duties of 'encouraging effective and relevant continuing professional development opportunities' as explained in the South African Standard for Principalship document (Department of Basic Education., 2014:16).

4.4.4 Monitoring curriculum

According to NEEDU (2013:11), an in-depth investigation into the complex ecological nature of the school can "... yield insight into both the substantive practices that underlie formal compliance and the causal relationships between these practices and student learning". Among the characteristics of good instructional leadership highlighted in NEEDU (2013), planning and coordination, assessment¹³ and professional development are very important. All three of these components relate to curriculum monitoring and implementation in some way. Below, we discuss the sub-themes of planning and assessment and the supervision of curriculum implementation.

4.4.4.1 Planning and assessment

Goal setting and planning form an important part of formal aspects of instructional leadership and this is highlighted in a number of studies (Kruger, 2003; World Bank, 2018). In one of the studies, principals acknowledge that instructional leadership is reflected in well-designed policy documents and well-presented annual and term planning (Kruger, 2003). When asked about assessment at the foundation phase level, most principals and teachers were knowledgeable about the requirement as stipulated

¹³ The Curriculum and Assessment Policy Statement (CAPS) document defines assessment as a continuous planned process of identifying, gathering and interpreting information about the performance of students, using various forms of assessments. Assessment should be both informal (assessment for learning) and formal (assessment of learning).

in the Curriculum and Assessment Policy Statements¹⁴ (CAPS). Most teachers reported that they had annual plans that are broken into terms and weeks. These assessment plans were set in accordance with the CAPS document for the foundation phase. Moreover, the assessment tasks that are administered to students correspond to the assessment plans. In describing planning, one of the teachers had this to say:

We have a year planner, term and weekly plans, and they are monitored by grade heads.

However, there was inconsistency in the way principals understood the programme of assessment stipulated in the CAPS documents. One school principal seemed not to be aware that at foundation phase level, there are a specified number of formal tasks that have to be administered each term. This may point to a lack of knowledge on the part of principals about the requirements of CAPS. The principal had this to say:

It's still tricky with the foundation phase when it comes to assessment because they do assessment continuously. They do not do it like we do in senior phase and intermediate phase where there are tasks that are set for each term. So, it's still tricky but we are trying because they have those tasks that they do continuously. There are CAPS documents for foundation phase but you don't get something that says these are the tasks for this term in the foundation phase ... they do everything daily, so it's something that continues every day.

Another principal expressed his reservation about the nature of assessment in CAPS. He was critical of the frequency of assessments that teachers are required to administer as per the CAPS document. According to him, CAPS encouraged teachers to assess more than what is desirable. The following is an extract of what the principal said:

CAPS will have you do 25 assessments in a term, I suppose, but we would have in the region of five to eight formal assessments ... and then there would be informal assessments along the way ... but obviously, we

¹⁴ This is a single comprehensive curriculum and assessment policy document that was developed for each subject to replace Subject Statements, Learning Programme Guidelines and Subject Assessment Guidelines in Grades R-12.

have major assessments twice a year after the second term and end of the year when they do their major examination.

4.4.4.2 Supervising curriculum implementation

There seems to be disagreement among education scholars about the responsibility of monitoring implementation of curriculum. On the one hand, some argue that the main responsibility of HODs is curriculum delivery (Nkonki & Mammen, 2012). These authors maintain that HODs should spend most of their time supervising teaching and learning in their respective subject or learning areas. This is in line with the distributed leadership framework. On the other hand, others are sceptical of delegating curriculum matters to middle managers (HODs) (Hoadley *et al.*, 2009). The authors are critical of distributed leadership due to its lack of conceptual clarity.

Several principals and teachers reported that the monitoring of teachers' work was done by checking that their plans and lesson plans corresponded. These were checked to determine whether they reflected the written work found in students' exercise books and that there was alignment with CAPS requirements. A principal from one school reported as follows:

Fortunately, just now I was requesting their tasks because when there is a problem it is the principal that is accountable. There should be submission of documents in time, assessment should be done. We have an assessment programme that indicates completion of assessment tasks by teachers. This allows us to enter students' marks as soon as assessment tasks are completed. Since ANA will be written soon, from now people should complete their tasks in time.

The CAPS document and the teacher's lesson plans allowed the principals to be able to supervise the implementation of the curriculum. At some schools, it was a routine that teachers had to submit teaching portfolios to the principal on a weekly basis, as one teacher said:

Every Monday morning our files have to go to the principal to see how we are going to teach and for how long we will be doing it and what we were teaching on that particular day.

A principal from another school also described a similar approach to curriculum implementation monitoring. The principal said:

We look at our guide where you will see that from this term this is the work that the teacher was supposed to do. You look at the formal task whether is there any correspondence between the formal task and the work that the teacher was supposed to do.

When most of the principals reflected on supervision of curriculum implementation, it appeared that they delegated this function to their head of departments. Direct supervision of the curriculum by the principals happened in few school. This finding is echoed in another South African study in secondary schools in which most principals regarded curriculum coverage as the responsibility of HODs (Hoadley *et al.*, 2009). From the two extracts below, it is evident that these two principals used different approaches on supervision of curriculum implementation. The first principal supervised the monitoring conducted by the HOD on implementation of the curriculum by teachers, while the second principal seemed to have delegated full authority for supervision of curriculum implementation to the HODs.

First principal:

The HOD will do her duties, but monthly I will go to the classroom, and check, sometimes not reporting to the HOD, just going there to check whether what the HOD reports is actually happening.

Second principal:

We have two HODs at that phase and they are the ... I don't want to say experts, but they know what is expected. And when we go to any report, I will sit with them and say explain, explain, explain. I'm not going to know it all, especially when it comes to foundation phase ... so I take from what they are saying.

On the whole, these views coincide with a number of earlier findings on instructional leadership, where principals spend minimal time directly attending to teaching and learning but play a more secondary and encouraging role (Kruger, 2003;(World Bank, 2018); Heystek, 2015). In one of these studies principals alluded to shared instructional leadership role in their schools and pointed out that the formal aspects of

leadership are delegated to subject heads and consequently “their own influence is more indirect and informal” (Kruger, 2003:210).

One way of supervising curriculum implementation is conducting class visits while teachers are teaching to check the classroom interaction with the students. Class visits (lesson observation) are among the requirements for teacher appraisal as stipulated in the Integrated Quality Management System (IQMS) (Weber, 2005). This is echoed in earlier South African research on instructional leadership (Bush *et al.*, 2010). When asked whether class visits are conducted in their schools, principals provided different responses. At one school, it was clear that class visits as a component of IQMS were not strictly followed, as one principal had the following to say on this subject:

We carry [out] class visits, mostly informally, because there is little time for formal class visits. I always tell my teachers; I am here to assist, to guide and not to judge.

At another school, the principal indicated the extent to which class visits were conducted at his school. He indicated that class visits were not only implemented to comply with IQMS, but were conducted to monitor teaching and learning. This is a similar finding to an earlier case-study in which it was found that in some schools classroom observation was used as a monitoring instrument (Bush *et al.*, 2010). The principal said the following:

It's unfortunate that you came here on a Friday. From Monday to Wednesday the HOD, Mr Phatshane, visited classes. He schedules visits for observation in class, not for IQMS, but for monitoring of teaching and learning in class. Mr Silani does the foundation phase and Mr Phatshane does the intermediate and senior phases. Those class visits motivate teachers because they are developmental. If they come into your class, after that you get feedback ... it motivates you to do more. He praises you when you do something good ... so it keeps the morale of the people high. These class visits are done monthly.

A substantial number of teachers expressed their positive attitude towards class visits. They viewed them as a developmental tool to improve their teaching. One teacher said the following:

I think this would develop me, so yes, I don't have a problem.

However, some teachers from affluent schools felt that class visits were not necessary unless someone had an issue with a certain aspect. Two teachers from two separate affluent schools indicated their stance against class visits as follows:

First teacher:

No, I don't think so; unless you are really struggling. Then you can have someone to check on you to see if you are on the line, especially for a first teacher with no experience.

Second teacher:

I don't think in this environment. And also, what would the benefits be in that? Like yes, if they come to your class and see you doing this, maybe they could give you advice on certain things, but I think it would be quite difficult. We should all be in a certain line. It could make some teachers feel they are better than others. We are striving to be better and having someone watching you is not really necessary.

These views were surprising coming from teachers in affluent schools. It would be expected that most teachers in these schools would welcome classroom observation, since they are more often considered experts in their fields that are well prepared for their classes. There is evidence in the “industrial model” of the school that teachers appreciate a high degree of autonomy in their own classrooms (Mosoge & Pilane, 2014). According to the behavioural science literature, strict monitoring can stifle innovation, and encourage average practices. This view underscores that a strict instructional programme might be beneficial to ensure the existence of a minimal level of required practice, but it cannot promote teaching excellence. This implies that classroom autonomy might be providing an incentive to these teachers, hence the resistance against the ‘intrusive’ classroom observation of the supervisor. However, there is a counter argument that complete discretion in the classroom is contrary to the ethos of professional accountability (Gill et al., 2016). These authors emphasise that the use of transparency in promoting professional accountability is contrary to the rule-based approach that perpetuates teacher autonomy instead of accountability.

4.4.5 District support

District support for schools is crucial for the promotion of quality teaching and learning, since education district offices are closer to the schools. Mavuso (2013) distinguishes between district roles of inspection and support by stressing that the former is perceived as undemocratic, while the latter is understood to be developmental. Mavuso (2013) (citing Lugaz & De Grauwe, 2010, and De Grauwe & Carron, 2007) also points out that district support serves a monitoring function to achieve quality teaching and supervision of schools.

There was mixed reaction among the school principals about their satisfaction with the support they receive from the district education officials. Eight out of 15 school principals highlighted several aspects they were not satisfied with about the district support. The areas of dissatisfaction that were reported include human resources (HR), infrastructure and curriculum support. A principal from one rural school had mixed perceptions on district support as he said:

Yes, we can give them 80%. My education development officer (EDO) is a cheerful person, humble, has lots of positivity and I am closer to him. He tries to fulfil my needs. In the department, the side that is pulling us down is the HR side.

Some school principals were ambiguous about district support. Although they understood that the support of district officials was not adequate, these principals seemed to have empathy towards the officials. They pointed out challenges faced by the district offices including understaffing and lack of finances. One principal said:

I think that they are having an uphill battle with finances and stuff, but I get along with my EDO very well. They help us where they can. The other stuff is more legal stuff, they can't just give you teachers, there is a whole process, so in general we can't complain.

However, other school principals revealed their frustrations with the level of support they receive from the district offices. A principal from one township school had this to say:

I am satisfied to a certain level. We've been asking for a general worker; we don't have a caretaker and a night watchman here. The school gets

broken into time and again. Last year we had three break-ins. We have been asking for classrooms. We have been waiting for 15 years for the school to be built.

Another school principal from an affluent school also expressed his dissatisfaction and frustration with the level of district support as follows:

Not satisfied. The support is non-existent. Even schools in the rural areas have the same problem that they don't have the support. I hadn't had an official in the school for 15 years. I don't think the department has the capacity of assisting the school. They have enough problems of their own. They are either in a funeral or they are on strike or they've got too few EDOs for instance. Our EDO has got, for instance, 15-20 schools to service ... how can you do that ... it's impossible. As EDOs leave they don't replace them. So, when you had 15 EDOs, now you have five EDOs, and the schools are being split among them. It's very frustrating in one respect, but we've learnt to live with them now ... we get on with what we have to do ... we are proud of what we do, we are proud of what we produce and we can do it on our own.

The views expressed by principals indicate their understanding and expectation of district support. Mainly they complained about the lack of administrative support from districts. Some of the principals referred to the presence of district support concerning the core business of teaching and learning, but there was no reference to classroom support of pedagogic instruction. It seems that the three education districts were struggling to support schools on non-core issues, such as providing non-teaching staff and buildings, as well as showing up at some schools.

4.4.6 Teacher vacancies

Teachers are the core staff for the Department of Basic Education and the schools since they are at the forefront of curriculum delivery. At times, schools lose their teachers due to several reasons. Some teachers leave for better opportunities elsewhere, others retire or resign, while others become incapacitated due to ill-health or death. When a school has lost a teacher, the principal should find a replacement as soon as possible. Several school principals indicated their understanding of the process they should undertake for the filling of teacher vacancies, but there seemed

to be differences in addressing the problem of vacancies. Mostly the principals were critical about the pace at which the department of education responded to teacher vacancies. They cited the infrequency of departmental advertisements as a major area of concern.

From the principals' responses it is evident that the schools do not deal with teacher vacancies in a similar way. For instance, school principals from the historically disadvantaged areas would wait for the departmental advertisements before they could appoint a teacher at the school. In these schools, when a vacancy arises, the workload of the leaving teacher is divided among remaining teachers until the department appoints a new teacher. This scenario is clearly illustrated by the following extract from one of the rural school principals:

We share the work among ourselves, like myself I'm overburdened. We still have vacancies and they are known by the department and we are waiting for interviews.

However, principals from former Model C schools approach teacher vacancies differently. When there is a vacancy they process all the necessary documents with the department, but they publish their own advertisements through the media and make SGB appointments since they have more funds drawn from school fees they charge. Once the department publishes the advertisements, the SGB-appointed teacher would be absorbed permanently into the departmental post. One former Model C principal described the process as follows:

It would be very nice if the department had gazettes regularly, which they don't ... so in most cases when somebody, from a department post, leaves, we have got to fill that post with a governing body person. So, we would advertise in the local press and we would then interview those shortlisted folks and we would appoint the best person we know.

From the above, the effects of teacher vacancies would be more pronounced in the historically disadvantaged schools. The long lag between identification of a vacancy and the ultimate filling of such a vacancy by the department would imply that teaching and learning in these school is hampered far more than teaching and learning in affluent schools. It is not yet clear whether the problem is with the inability of the

schools to plan or the inability to supplement departmental funding with supplementary funding via school fees, like the former Model C schools.

4.4.7 Teacher unions

The post-apartheid South Africa has experienced a rise in political activism and union activism. This development is not surprising given the political history of South Africa. The education sector has not been spared from unionism. Trade unions are legal entities that are meant to protect the rights of workers. In the education sector, teachers (as workers) have unions that advocate for the right of teachers. These rights or causes include salary increases and improved working conditions, such as housing allowances and medical aid, etc. There are several unions that represent teachers and they include the South African Democratic Teachers Union (SADTU), the National Professional Teachers' Organisation of South Africa (NAPTOSA), Suid-Afrikaanse Onderwysunie (SAOU), and others.

In recent years, there has been a perception in the media that the activities of some dominant unions, especially SADTU, which is an affiliate of the Congress of South African Trade Unions (COSATU), have been detrimental to teaching and learning in schools.

In our interviews, the sampled principals and teachers were asked to report their perceptions and experiences of union activity in their schools. As expected there were mixed responses on this topic, but with most respondents indicating that there were disturbances that were caused by SADTU activities, especially meetings during working hours. One principal from a township school said:

Let me be open here. In this district, when the unions are having meetings, they start from 12. We break at 12 and go to our union meeting and that is one problem that we have. These are the things that hamper teaching and learning because we break two hours before [official closing] time.

Another principal from a township school also expressed her dissatisfaction about the conduct of SADTU members:

I was a chairperson of SADTU far back. Then we used SADTU as a sharp knife in both sides. To be a SADTU member then, you should be

an example at school. But now, you'll find that a SADTU member is a spoiler in the school, especially if she is site steward. Every day, SADTU, SADTU, going to meetings, etc. She will not even care what provision is done to cover her during her absence. If you go to SADTU to ask, they will turn against you.

The interference of SADTU with the tuition time was admitted by one of the school principals who was also a branch executive member. The principal responded as follow:

I am secretary of SADTU. When I am addressing teachers, I tell them that when we release you from schools you do your own business in town. Our resolution was that teachers should not leave schools before 12.

Another principal expressed his frustration about SADTU's lack of regard for tuition time. The principal indicated that in his school, half of the teachers belong to SADTU and the other half to NAPTOSA. He went on to say:

So, if SADTU has a meeting, it's impossible to carry on with teaching and learning if half of the staff is gone. Meeting start at 11; they will come and say we want to leave at 10. I will just phone the department and say 'What do I do now? I cannot run the school with half of the staff'.

This principal also indicated that some SADTU members in his school were even refusing to be visited in class for monitoring purposes, saying that they first needed to consult with their union.

However, another principal who had teachers that belong to both these unions, i.e. SADTU and NAPTOSA, had a way to manage the issue of meetings by insisting that the teachers leave at 1 o'clock. He stated this as follows:

I think that there is a place for unions but they shouldn't interfere with the day-to-day running of schools. I won't mention names, there [are] unions that want to have meetings during school hours. That we don't allow and we share information with members of our staff and we tell them, look you can go at that time but you can't go at 10. SADTU is very fond of that. I think most principals won't have a problem letting their SADTU members go, say, at 1 o'clock to attend, but we can't allow 10 o'clock,

you understand? What about the classes. My staff understand that I can't let them go at 10 ... they must teach.

4.5 Conclusions from qualitative research

A study to measure management quality in schools using standardised surveys to codify management practices (Bloom, Lemos, Sadun & Van Reenen, 2015) found that management practice scores were associated with school leadership and accountability for student performance to an external body. In this research, we found that instructional time was not honoured as per the stipulation of the policy. Most principals avoided dealing with non-adherence to instructional time policies, as there were rare instances where rules and policy were enforced. Generally, principals demonstrated understanding of processes for monitoring curriculum implementation. However, it appeared as if the supervisors were more interested to see congruence of teacher plans with the content taught without paying much attention to quality of what was taught. In this regard, evidence suggests that some principals abdicated the responsibility of monitoring to their HODs and did not understand what was happening in the classrooms.

District support was also a challenge and this indicates that the problem is not isolated to school level. This is problematic in light of recent evidence (Muralidharan et al., 2017) that increasing school inspection contributes greatly in reducing teacher absence. Given the weak authority of principals caused inter alia by strong union influence, district officials should ensure teacher accountability in schools by visiting schools frequently to monitor teachers' schoolwork. Finally, it was clear that accountability lines are not clear. Most principals appear to be accountable to union leadership instead of departmental officials.

5. MULTIVARIATE ANALYSIS FROM TIMSS 2015 DATASET

In this section, we model student achievement using the Trends in International Mathematics and Science Study (TIMSS) 2015 dataset. An effort to gain a better understanding of what influences student learning can benefit educators and policy makers, "...since it is through multivariate analysis that one can tease out which of the many possible explanatory variables are most closely associated with student

learning” (Spaull, 2012:9). In the education context, many variables are highly correlated with each other, and it is possible to erroneously draw conclusions from bivariate analysis of such variables. For instance, from a cross-tabulation of teacher qualifications and mathematics scores using data from South African TIMSS, it may on the surface appear as if there is a clear relationship between the two variables. However, there are a myriad of other variables that influence student performance in mathematics, including socio-economic statuses of students, access to textbooks, language of teaching and learning at home, level of parental education, etc. Some of these variables may, in turn, be correlated with teacher qualifications in certain schools. Multivariate analysis can better isolate correlations between variables than only bivariate analysis and provide some indication of mechanisms that influence student learning as it holds other correlates constant.

Using the TIMSS 2015 South African data, we employed an education production function method to model the mathematics performance of South African Grade 5 and 9 students. With almost all retrospective data, there are certain statistical problems that should always be considered, and these include omitted variable bias¹⁵, endogenous programme placement¹⁶ and measurement error¹⁷ (Glewwe & Kremer, 2006). Due to the cross-sectional nature of the TIMSS data, we were unable to use alternative approaches such as, for example, panel data analysis. We thus exercised caution when interpreting the results and drawing inferences from the education production function analysis, and interpreted the coefficients as conditional correlations (Spaull, 2012).

The empirical analytical framework used in this part of the paper is adapted from Dong and Cravens’ (2011) six-core components learning-centred leadership model. Unlike in TIMSS 2007, TIMSS 2015 does not cater for performance accountability measures such as observation by principal, observation by external inspection, teacher peer

¹⁵ Omitted variable occurs if any of the unobserved elements in econometric estimation that are part of the error term are correlated with the observed variables in the dataset. Examples of variables that are almost impossible to observe include the child’s innate ability and motivation, parents’ willingness and capability to help their children with schoolwork, teachers’ interpersonal skills and motivation, and management skills of school principals.

¹⁶ Endogenous programme placement occurs when government deploys educational inputs in areas that already have good education outcomes. Motivation for that may emanate from political influence these areas may have, the areas may pay more taxes, and may put higher weight on education than other areas when selecting how to spend the resources they get from the central government.

¹⁷ Measurement error is the difference between the value of a characteristic provided by the respondent and the true (but unknown) value of the characteristic.

review and incentives to recruit or retain teachers. Therefore, we substituted the performance accountability component with a school discipline component as represented by teachers' absence from school and teachers' late arrival at school. School discipline is very pertinent in the context of South African school education. Several studies highlight discipline in South African schools as instrumental in student achievement. Figure 2 shows the main components of the modified learning-centred leadership model.

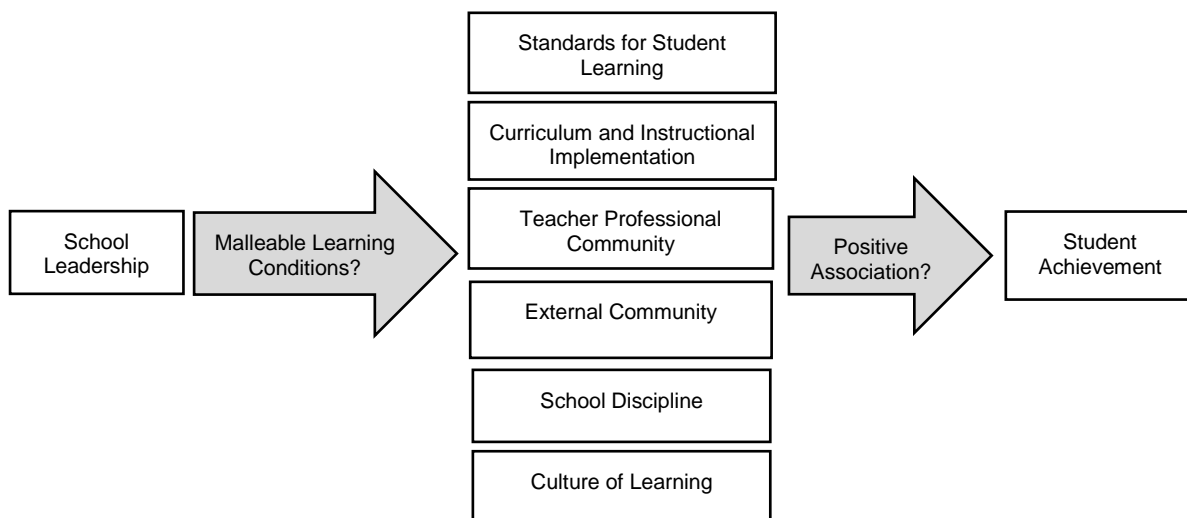


Figure 2: Analytical framework

Source: Dong and Cravens, 2011

Each component of the learning-centred leadership framework captures specific TIMSS questionnaire items from school and teacher backgrounds. Within the culture of learning component, we included questions for teacher motivation in line with the qualitative component of this study. In addition to learner motivation, teacher motivation plays a significant role in the culture of learning.

In the next section, we argue that the data used in this part of the paper, which comes from TIMSS, consist of a rich collection of schools, teacher and student variables. After explaining the data and describing the overall mathematics results, we explain the method employed in the study. This is followed by descriptive and regression results. The last section concludes.

5.1 Data

The data used in this study is the sixth administration of the TIMSS assessment conducted in 2015. TIMSS is an international assessment of mathematics and science knowledge of Grade 4 and 8 students. It was developed by the International Association for the Evaluation of Educational Achievement (IEA) to allow participating nations to compare students' educational achievement across countries. TIMSS was first administered in 1995, and every four years thereafter – 1999, 2003, 2007, 2011 and 2015. The assessment is designed to align broadly with mathematics and science curricula in the participating countries. The results suggest the extent to which students have mastered mathematics and science concepts and skills that are supposed to have been taught in school (LaRoche, Joncas & Foy, 2016).

In this large-scale assessment, student performance in mathematics and science in Grades 4 and 8 was tested using multiple-choice questionnaires. Performance results in TIMSS are reported on a scale that has an average of 500 and a standard deviation of 100 points (Dong & Craven, 2011). TIMSS also collects background information on students, teachers and schools to allow for comparison among countries of educational contexts that may be related to student achievement. The advantage of TIMSS for this study is the extensiveness with which it collects data on school leadership and management, instructional time and professional development of teachers (LaRoche et al., 2016).

Internationally, the TIMSS target population at the lower grade is all students in their fourth year of formal schooling, and at the upper grade, all students in their eighth year of formal schooling. TIMSS uses UNESCO's International Standards Classification of Education (ISCED) 2011, which provides an internationally acceptable classification scheme for describing levels of schooling across countries. The first year of ISCED Level 1¹⁸ corresponds to a transition point in the education system that marks the beginning of systematic teaching and learning in reading, writing and mathematics. Four years after the first year of ISCED Level 1 would be the target grade for fourth grade TIMSS, and is the fourth grade in most countries. Similarly, eight years after the first year of ISCED Level 1 is the target grade for eighth grade TIMSS and is the eighth grade in most countries. However, TIMSS wants to avoid testing very young students

¹⁸ ISCED Level 1 corresponds to primary education or the first stage of basic education.

given the cognitive demands of the assessments. Therefore, if for the fourth-grade students the average age at the time of testing would be less than 9.5 years, and for the eighth-grade students the average age would be less than 13.5 years, TIMSS recommends assessing the next higher grade (i.e., fifth grade for fourth grade TIMSS and ninth grade for eighth grade TIMSS) (LaRoche et al., 2016).

In South Africa, the school admission policy provides that children must be five years old and have their sixth birthday by June 30th of the following year to be accepted in grade 1 (South African equivalent of first year of ISCED Level 1) during the current year (Republic of South Africa, 2002). For the fourth grade TIMSS, the average age of many students in South Africa four years after grade R would be less than 9.5 years, and for the eighth grade TIMSS, their average age would be less than 13.5 years. In earlier TIMSS assessments when Grade 4 and 8 students were tested, the South African data showed that a high number of students did not attempt to answer many of the items, which made estimating achievement scores very difficult. Thus, to provide better estimates and to follow TIMSS' recommendations, in 2003 South Africa tested Grade 5 and 9 students (in addition to Grades 4 and 8), and in 2011 and 2015 only Grade 5 and 9 students were assessed. For the purposes of this study, only Grade 5 and 9 mathematics scores are considered.

The TIMSS 2015 sample for South Africa's Grade 5 and 9 students was drawn from the Department of Basic Education's 2013 master list of all schools in the country. The list comprised of 17 824 schools (16 682 public and 1 142 independent schools) that offered Grade 5 classes, and 10 009 schools (9 099 public and 910 independent schools) that offered Grade 9. The South African sample is stratified based on the province, school type (public and independent), and language of learning and teaching (Afrikaans, English and dual-medium). Altogether a total of 10 932 Grade 5 learners from 297 schools and 12 514 Grade 9 learners from 292 schools took part in the study, including 298 and 334 mathematics teachers, respectively. The large size of the dataset makes TIMSS 2015 very suitable for analysing the association between instructional leadership variables on student performance outcomes (LaRoche et al., 2016).

At the fourth-grade level, 49 countries participated in the TIMSS 2015 study, with only Norway and South Africa taking part at the fifth-grade level. A total of 39¹⁹ countries participated in TIMSS 2015 study at the eighth-grade, and three countries took part at the ninth-grade level (Norway, Botswana and South Africa). Of the total participating countries, despite its grade-level advantage, South Africa was the second lowest performing country in both grades in mathematics with an average score of 376 points for Grade 5 and 372 points for Grade 9²⁰. For both grades, South Africa scored more than one standard deviation below the midpoint.

5.1.1 Socio-economic status variables

Since the seminal Coleman report (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld & York, 1966), there has been a great emphasis on how the collective socio-economic statuses (SES) of the students in a school can influence individual student achievement. There is empirical evidence that schools with a relatively high number of socio-economically disadvantaged students perform poorly due to weaker teaching and learning cultures (TIMSS 2015). There is also agreement among scholars that educational achievement amongst South African children is strongly associated with SES (Taylor, 2011; Taylor & Yu, 2009; Van der Berg, 2007). A large survey such as TIMSS does not contain information about household income or expenditure since students are not expected to provide reliable information on these variables. It is therefore a common practice to derive household asset-based measures of SES. In TIMSS 2015 the student questionnaire asked Grade 9 students about the presence of several possessions or assets in their homes.

Using the student background questionnaire, TIMSS 2015 collected data on several students' home assets. We used the asset data to estimate an asset index using multiple correspondence analysis (MCA) to serve as a proxy for students' SES. MCA is recommended for construction of an index using only categorical variables (Spaull,

¹⁹ Countries that participated in the TIMSS 2015 assessment are listed alphabetically as follows: Australia, Bahrain, Botswana, Canada, Chile, Chinese Taipei, Egypt, England, Georgia, Hong Kong SAR, Hungary, Iran (Republic of), Ireland, Italy, Japan, Jordan, Kazakhstan, Korea (Republic of), Kuwait, Lebanon, Lithuania, Malaysia, Malta, Morocco, New Zealand, Norway, Oman, Qatar, Russian Federation, Saudi Arabia, Singapore, Slovenia, South Africa, Sweden, Thailand, Turkey, United Arab Emirates, United States.

²⁰ Singapore had the highest scores for both mathematics and science, with 621 points for mathematics and 597 points for science.

2011:7; Howe, Hargreaves & Huttly, 2008). A total of 13 variables²¹ were used in the construction of the asset index for the two grades.

The factor loadings of the individual variables are reported in Table A 1 in Appendix A for both Grade 5 and 9 datasets. We hypothesised the ownership of assets by students from higher socio-economic background to contribute positively to asset index scores (Table A 1). There is one asset (television) for which ownership contribution is slightly positive in both indices (0.35). However, the two indices attach highest positive contribution to two different assets. For Grade 5 asset index, the highest ownership contribution of 1.6 is for the number of books, while for Grade 9 the same highest weight is for the gaming system. These assets were more likely to be found in the households which the asset index most likely estimated as the wealthiest households in the sample(s). The first dimension of MCA accounts for 89.1% and 89.0% of inertia (variation) for Grade 5 and 9 respectively, and it is this dimension that is used to estimate the asset indices. The asset index scores range from -2.8 to 1.6 and -3.8 to 1.6 for Grade 5 and 9.

An additional variable (school SES) was derived from student SES by taking the average of all the students' SES scores in each school and assigning this average to each student as school SES. Figure 3A-B and 4A-B show boxplots of mathematics achievement by school quintile (Figure 3A-B) and provincial distribution (Figure 4A-B). The information in Figure 3A-B shows that students studying in schools belonging to the highest quintile (quintile 5) perform relatively better than those in schools belonging to the lower quintiles. In an earlier study, Spaul (2011), using SACMEQ III data, also concluded that the student performance distribution was bi-modal, i.e. there was a distinct split in scores between the top quintile compared to the bottom-four quintiles, indicating a possibility of two data-generating processes at play. Information in figures 4A-B also attests to the thesis of two data-generating processes. In South Africa students that study in schools situated in affluent provinces such as Gauteng and Western Cape have higher mathematics scores for both grades, while those in schools situated in poorer provinces such as the Eastern Cape and Limpopo have lower mathematics scores.

²¹ Asset index variables include the following home possessions: cell phone, computer, shared computer, internet connection, gaming system, own room, study desk, electricity, running tap water, television, dictionary, number of books and number of digital devices.

Figure 3 A-B: Boxplots of Mathematics scores by quintile of school mean SES

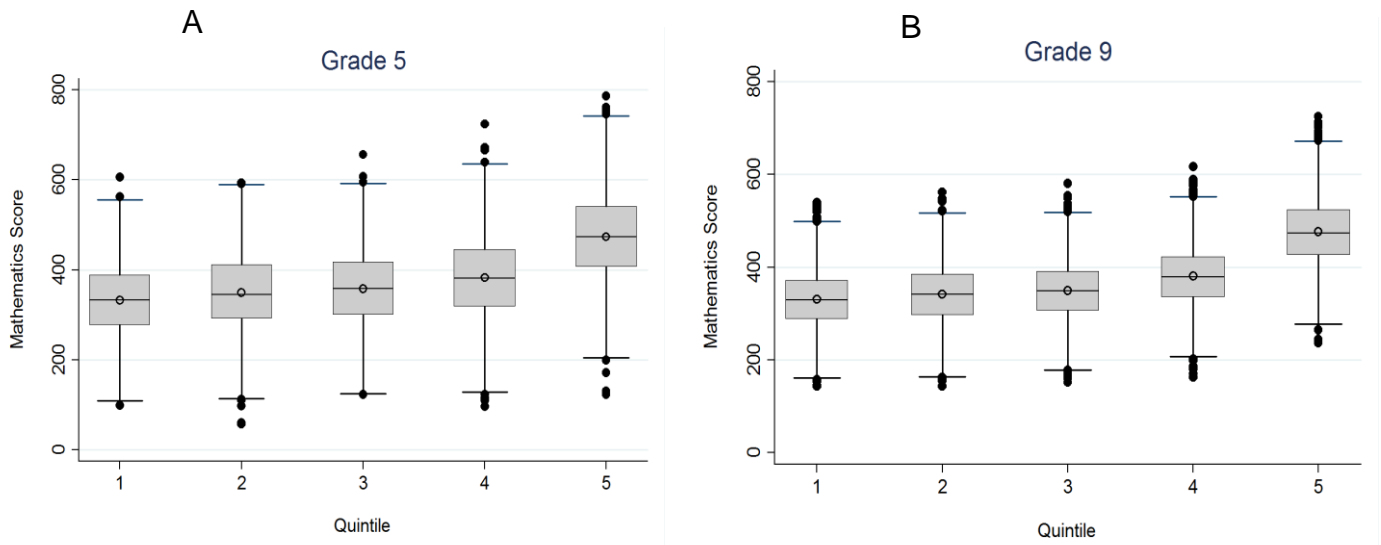


Figure 4 A-B: Boxplots of Mathematics scores by provinces

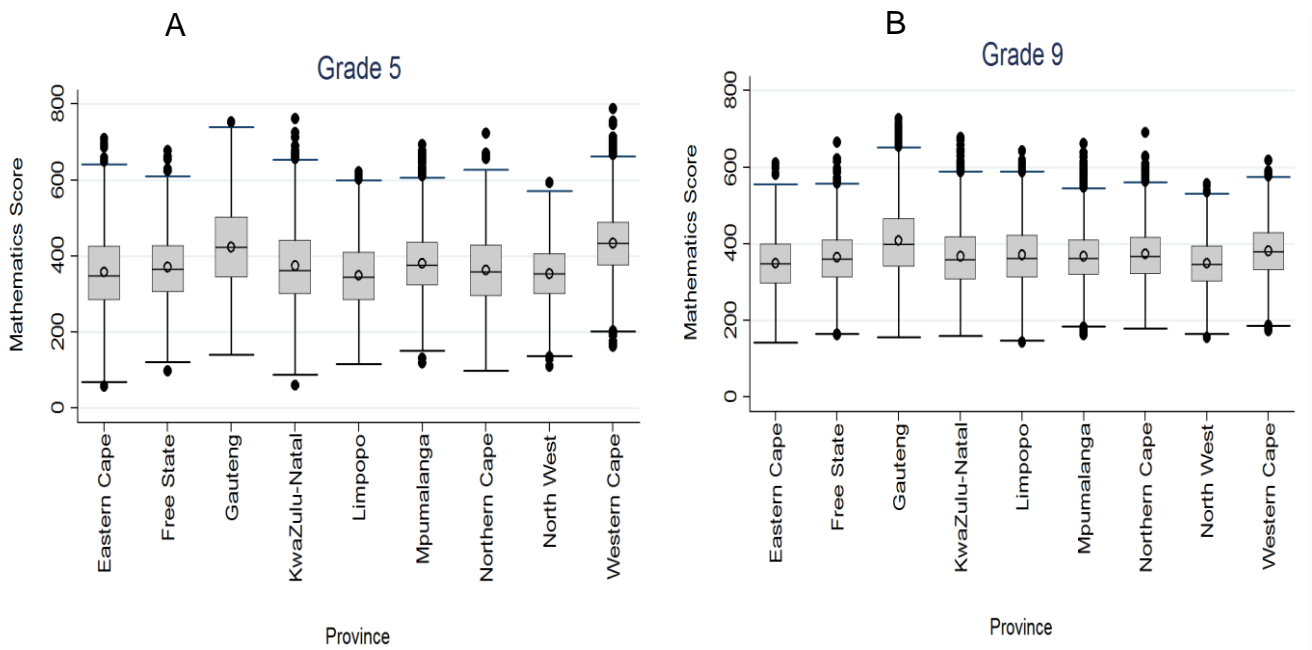


Table 4 indicates and confirms that the mean performances of school quintile is predominantly unchanged between the lowest quintiles and the highest quintile. However, students' marks in the most affluent quintile jump up by more than 25% for both mathematics and science. Considering the proportion of students performing at 500 or above (the TIMSS mean) or below 400 (one standard deviation across all participating countries below the mean), the richest quintile again outperforms the rest of the quintiles. This is consistent with findings from previous research (Van der Berg, 2008: 146).

Table 4: Distribution of Grade 9 student performance across school quintiles by means of SES Schools

School SES quintile	Mean	Standard	% with mark above	% with mark below 400
Student Mathematics scores				
Quintile 1	330.53	62.73	1.25	23.02
Quintile 2	341.68	64.35	1.93	26.27
Quintile 3	348.54	63.79	3.30	25.92
Quintile 4	380.52	65.18	12.27	21.39
Quintile 5	476.60	73.48	81.25	3.40
Total	371.42	81.74	7.03	66.99
Student Science Scores				
Quintile 1	300.31	78.79	1.02	23.08
Quintile 2	315.89	81.10	1.67	26.54
Quintile 3	329.08	81.89	4.36	25.53
Quintile 4	372.15	79.91	14.66	21.26
Quintile 5	485.22	85.54	78.29	3.59
Total	355.66	101.69	8.61	69.10

5.1.2 Instructional leadership variables

Since this study's aim is to examine the association between instructional leadership and student achievement, it was essential to identify variables that deal with the leadership role of the principals. In this regard, it should be noted that TIMSS 2015 school and mathematics teacher questionnaires included several identical questions regarding school learning conditions. Based on the theoretical literature, we grouped

selected variables into six measures of learning conditions, after minor modification²², that are likely to be influenced by instructional leadership: (a) standards for student learning, (b) curriculum and instruction implementation, (c) teacher professional community, (d) external community, (e) culture of learning, and (f) school discipline following the example of Dong and Cravens (2011).

Questions on school leadership and management involved asking school principals the extent to which teachers understand the school's curricular goals and the extent to which teachers are successful in implementing the school's curriculum. The school principal's responses to these questions provided an indication of the extent of instructional leadership he/she provides in the school. The same set of questions on school leadership was also asked to teachers. Other questions that are related to school leadership include questions on teachers' absence from school, teachers' late arrival at school, the frequency of mathematics homework provided to students and satisfaction of teachers with teaching as a profession.

In addition, we included control variables for the background of schools, teachers and students. These variables were carefully selected based on the literature.

The dependent variable for the analyses was the first of five plausible values²³ for mathematics and science scores for each student from TIMSS 2015. The explanatory variables were derived from contextual questionnaires administered to the school principals, mathematics teachers, and students sampled. These variables will be discussed further in this paper.

5.2 Method

The retrospective TIMSS data was analysed using bivariate and multivariate methods. The variables found in TIMSS are a mixture of continuous, categorical, and binary variables. After creating binary versions of the instructional variables, we used t-tests (mean-comparison tests) to determine the statistical significant difference between the two means for each binary variable.

²² We substituted the learning condition for performance accountability with school discipline due to data unavailability for the former.

²³ Plausible values are multiple values representing the likely distribution of a student's proficiency. They are based on student responses to the subset of items they receive. They are not individual scores in the traditional sense, and should therefore not be analysed as multiple indicators of the same score (von Davier, Gonzalez & Mislevy, 2009).

In an education production function, various student, teacher and school characteristics are used to explain student achievement. Our analytical strategy encompassed an iterative process where we included various variables that proved to be strongly related to student achievement. For ease of interpretation, we standardised all the continuous variables to take a value between 0 and 1 and coded the categorical variables as dummies, i.e. taking on a value of either 1 or 0.

Using the TIMSS 2015 South African data we employed an education production function method to model the mathematics performance of Grade 5 and 9 South African students. With almost all data of this nature, there are certain statistical problems that should always be considered, and these include omitted variable bias²⁴, endogenous programme placement²⁵ and measurement error²⁶ (Glewwe and Kramer, 2006). Due to the cross-sectional nature of the TIMSS data, we were unable to use alternative approaches such as, for example, panel data analysis. We thus have to exercise caution when interpreting the results and drawing inferences from the education production function analysis, and we interpreted the coefficients as conditional correlations (Spaull, 2012).

The basic education system in South Africa can be described as consisting of two sub-systems. On the one hand, there is a high achieving functional system that comprises historically privileged schools, while on the other hand we have a low performing dysfunctional system that primarily consists of historically disadvantaged schools (Van der Berg, 2007; Taylor, 2011; Spaull, 2011). When one analyses any characteristic that affects student performance, it is therefore imperative to consider this dual education system to avoid bias. Reliance on a single model might persuade a researcher to believe that there is a relationship between student performance and a variable, whilst that 'relationship' is propelled by differences between the two systems (Taylor, 2011). Cognisant of the bimodal distributions of student scores for

²⁴ Omitted variable occurs if any of the unobserved elements in econometric estimation that are part of the error term are correlated with the observed variables in the dataset. Examples of variables that are almost impossible to observe include the child's innate ability and motivation, parents' willingness and capability to help their children with schoolwork, teachers' interpersonal skills and motivation, and management skills of school principals.

²⁵ Endogenous programme placement occurs when government deploys educational inputs in areas that already have good education outcomes. Motivation for that may emanate from political influence these areas may have, the areas may pay more taxes, and may put higher weight on education than other areas when selecting how to spend the resources they get from the central government.

²⁶ Measurement error is the difference between the value of a characteristic provided by the respondent and the true (but unknown) value of the characteristic.

mathematics as reflected by the descriptive statistics, we ran two sets of regression models to establish if similar factors pertaining to school leadership are equally important for each of the sub-sets of students. The two sets of models are as follows:

- 1) The first model is a general regression model without any restrictions imposed.
- 2) SES restriction: The second model consists of two regression models restricted to different SES quintiles of schools. The first specification is restricted to the top SES quintile, while the second specification is restricted to the bottom four quintiles.

Within each of the three models we separately regressed four sets of instructional leadership variables as the main variables of interest. These variables are described in Table 5.

Table 5: Instructional leadership variables

	Model 1 (Whole sample)	Model 2 (Quintile 5)	Model 3 (Quintile 1 to 4)
1 st set of variables	Principal-reported teachers' understanding of curricular goals Teacher-reported teachers' understanding of curricular goals	Principal-reported teachers' understanding of curricular goals Teacher-reported teachers' understanding of curricular goals	Principal-reported teachers' understanding of curricular goals Teacher-reported teachers' understanding of curricular goals
2 nd set of variables	Principal-reported teachers' degree of success in implementing curricular goals Teacher-reported teachers' degree of success in implementing curricular goals	Principal-reported teachers' degree of success in implementing curricular goals Teacher-reported teachers' degree of success in implementing curricular goals	Principal-reported teachers' degree of success in implementing curricular goals Teacher-reported teachers' degree of success in implementing curricular goals
3 rd set of variables	Principal-reported teachers' absence from school	Principal-reported teachers' absence from school	Principal-reported teachers' absence from school
4 th set of variables	Principal-reported teachers' late arrival at school	Principal-reported teachers' late arrival at school	Principal-reported teachers' late arrival at school
5 th set of variables	Frequency of homework exercises	Frequency of homework exercises	Frequency of homework exercises
6 th set of variables	Satisfaction with being a teacher	Satisfaction with being a teacher	Satisfaction with being a teacher

We used the student probability weight (*pweight*) and the classrooms as the primary sampling units (PSUs). The probability weights are adequate for handling random samples where the probability of being sampled varies. However, since the students are not sampled independently but are sampled in schools and/or classrooms, we specify the estimates' *vce* (cluster *clustvar*) option, where *clustvar* is the classroom (StataCorp, 2013). Student performance in the same classroom or school may not be independent. Students in the same classroom or school may display similar attributes such as study habits, attitudes, being taught by the same teachers, etc., and these may influence their performance scores. The use of classrooms as the PSUs enabled us to take into account the sample stratification and the clustering of standard errors. The unit of analysis throughout the study is students. Using students as the unit of analysis allows for an analysis that is representative of the population. When analysing the instructional leadership variables relative to student achievement, the aim is to examine how students' performance varies in response to the presence or absence of these variables at schools.

5.3 Results and discussion

5.3.1 Sample characteristics

A summary of the socio-demographic characteristics of the sample is provided in Table A 2 in the Appendix. Most students attended schools in small towns or villages (Grade 5: 31.6%; Grade 9: 33.1%) and remote rural areas (Grade 5: 27.5%; Grade 9: 29.8%). A substantial number of students (65%) spoke less of the language of instruction (English) at home for both grades. There was also a high percentage of students who were taught in schools in which the principal had relatively little experience (0 to 5 years) – 32.7 % and 39.6% for total principal experience, while there was 40.1 and 46.8% for principal experience at present school in the case of Grades 5 and 9 respectively. Most students were taught in schools where principals were adequately qualified (bachelor's degree or equivalent) – 66.2% and 77.6% of students for Grades 5 and 9.

5.3.2 Descriptive findings

Table A 2 in the Appendix also shows principal-reported and teacher-reported perceptions on the main explanatory variables. We found that there were stark differences between principals' and teachers' perceptions across the instructional leadership variables in TIMSS 2015 school and teacher questionnaires. This finding was like the one found by Dong and Cravens (2011) in their analysis of TIMSS 2007 questionnaire items. However, contrary to Dong and Cravens where principals reported higher average ratings than teachers, we found that teachers consistently reported higher ratings (on a scale from 1 = very high to 4 = low) than principals on both teachers' understanding of curriculum goals and their degree of success in curriculum implementation (see Table A 2). This finding applied in both Grade 5 and 9 results.

As reported by principals, time spent on teaching was not adversely affected. As Table A 2 illustrates, we found that principals reported minimal occurrence of the incidence of both teacher absence and late arrival at school. The principals, however, reported slightly higher rates of teacher absence (27.1% vs 16.5%) and late arrival at school (17.9% vs 10.5%) in Grade 9 than in Grade 5 (on a scale from 1 = not a problem to 4 = serious problem). The percentages provided here consist of ratings where principals reported moderate and serious problem of the occurrence of teacher absence and teachers' late arrival at school.

About the frequency of mathematics homework assigned to students, a higher percentage of teachers in Grade 9 than in Grade 5 reported giving their students homework frequently (frequently refers to assigning homework three or four times a week to every day). However, in terms of teacher satisfaction (on a scale of 1 = very often to 4 = never or almost never) a significant number of teachers (26.2%) in Grade 9 reported that they were less satisfied with being a teacher.

5.3.3 Regression analysis and results

As Spaul (2011) points out, it is complicated to isolate the impact of different variables during quantitative analysis on education data, particularly in the South African context. The complications arise because of interdependence of variables and the consequent difficulty in disentangling the multi-directional causation between them.

For instance, in an instructional leadership study, a significant teacher qualification variable “completed first degree or honours” might be interpreted as that the variable was the cause of the positive impact on student achievement. On the other hand, the large coefficient might be more attributable to higher teacher qualification being correlated with good school leadership, i.e. highly qualified teachers are attracted to teach in well-managed and well-led schools.

To determine the association of instructional leadership variables with student performance, we regressed different types of instructional leadership variables on student mathematics scores. We initially regressed the instructional leadership variables and control variables in one regression, but when combining the instructional leadership variables in one regression, multicollinearity exists, as these variables might be measuring the same underlying concept. We thus regressed different instructional leadership variables with control variables separately. We started with teachers’ understanding of curricular goals (both principal-reported and teacher-reported) as the main variables of interest. This was followed by teachers’ degree of success in implementing curricular goals. Thereafter, we used teachers’ absence from work as the main variable of interest. Finally, we used teachers’ late arrival at school.

Table 6 summarises the expected signs of coefficients and the rationale for the expected signs.

Table 6: Expected sign and rationale of variables included in regression analysis

Variable	Expected sign	Rationale
Teachers' understanding of curricular goals	Positive	The understanding of curricular goals by teachers is expected to be translated into better academic performance by students.
Teachers' degree of success in implementing curricular goals	Positive	As curricular goals are implemented in the classroom, students are expected to perform better.
Teachers' absence from schools	Negative	When teachers are absent from school, tuition is negatively affected. As a result, students are expected to perform poorly.
Teachers' late arrival at school	Negative	Like teacher absence, late arrival affects instructional time and consequently students are expected to perform poorly.
Frequency of homework exercises	Positive	The higher the number of homework exercises provided to students, the higher their academic performance.
Satisfaction with being a teacher	Positive	When teachers are satisfied with their job, their performance improves and so the students' academic performance
Student socio-economic status	Positive	Students from high socio-economic backgrounds are expected to perform better at school.
School socio-economic status	Positive	A higher school's socio-economic status is expected to accelerate the academic performance of students.

Table 7 reports the results of ordinary least squares (OLS) regression models that predict mathematics achievement in Grade 5 and 9 when variables of teachers' understanding of curricular goals are the main variables of interest. As in Taylor (2011:75), the way to interpret each coefficient depends on whether the considered explanatory variable is a continuous or a binary ('dummy') variable. For instance, student SES is a continuous variable with a standard deviation of one. In the full-sample model reported in Table 7 the coefficient on 'Student SES' is 4.024 for Grade 5. This means after controlling for all the other explanatory variables in the model, a one standard deviation increase in student SES is associated with an improvement of 4.0 percentage points in Grade 5 mathematics achievement. The variable for teacher-reported teacher's understanding of curricular goals, on the other hand, is a binary dummy variable taking a value of either one (students are taught by teachers who have a higher understanding of curricular goals) or zero (students are taught by

teachers who have a lower understanding of curricular goals). In Table 6 in the Grade 5 mathematics full-sample model, the coefficient of 21.15 indicates that being taught by a teacher who self-reports having a one standard deviation higher understanding of curricular goals is associated with Grade 5 mathematics achievement that is 21 percentage points higher.

The results suggest the presence of strong association between teachers' understanding of curricular goals and student achievement at the Grade 5 level. This finding held for both the principal-reported and teacher-reported measures but the significance was not found in all the models. In the case of principal-reported measure of teachers' understanding of curricular goals the association with student achievement was found to be strong in the highest quintile, whereas in teacher-reported measure the association appeared to be strong in the whole sample and the lower quintiles. However, we found the association between both the principal-reported and teacher-reported teachers' understanding of curricular goals and student achievement to be positive but insignificant for Grade 9. This was in line with findings by Dong and Cravens (2011).

Table 7: Teacher understanding of curricular goals for both grades

	Grade 5			Grade 9		
	Whole sample	Quintile 5	Quintile 1-4	Whole sample	Quintile 5	Quintile 1-4
Principal-reported teachers' understanding	7.452 (7.242)	20.24** (9.269)	5.671 (7.252)	6.821 (4.290)	7.540 (7.177)	6.594 (4.265)
Teacher-reported teachers' understanding	21.39** (8.536)	16.09 (11.68)	21.49** (8.545)	7.075 (4.783)	7.667 (8.725)	6.605 (4.744)
Student SES	3.976*** (1.315)	8.368 (38.30)	2.196 (2.626)	1.644 (1.002)	13.40 (101.6)	-1.720 (1.607)
Student SES squared	-2.632** (1.084)	0.478 (13.35)	-5.181*** (1.665)	-0.902 (0.646)	-2.623 (41.84)	-2.506*** (0.906)
School SES	64.09*** (6.590)	102.4*** (11.83)	58.57*** (7.155)	74.65*** (6.136)	74.63*** (9.883)	72.79*** (6.782)
School SES squared	32.39*** (5.572)	9.093 (10.85)	30.73*** (5.960)	44.73*** (4.741)	44.67*** (11.68)	43.33*** (5.286)
Constant	308.6*** (12.75)	286.1*** (31.52)	309.6*** (13.24)	321.2*** (7.194)	305.8*** (60.97)	322.8*** (7.150)
Observations	9124	1873	7321	11394	2104	9290
R-squared	0.422	0.598	0.267	0.467	0.571	0.319

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other controls: Instructional time, Grade enrolment, Economic disadvantage, Area type, Principal qualifications, Principal experience, Principal experience at current school, Teacher's gender, Teacher qualification, Teacher age, Student age, Student gender, Language of test spoken at home.

As expected, student SES was positively associated with mathematics achievement in TIMSS 2015 and this was significant only for the full sample, whilst the size of the coefficient was very large for the higher quintile and very small for the lower quintiles. This may be attributed to differences in resources between children from affluent home backgrounds and those from poor home backgrounds. The student SES coefficient for mathematics (in all models) was positive and the square negative, meaning that higher student SES was associated with an increase in mathematics achievement but with a concave shape. However, the school SES (and the square thereof) were both positive and contributed a significant and substantial impact towards student achievement for mathematics in all the models and in both grades. This implies that once students are placed in school, it is the school's SES that plays a prominent role in performance rather than the SES of the individual. The positive coefficient of the square of the school's SES indicates a convex shape – at higher levels of school SES the gradient increases even further.

Table 8 reports the results of OLS regression models that predict mathematics achievement in Grade 5 and 9 when variables for teachers' degree of success in implementing curricular goals are the main variables of interest. In Grade 9 the association between principal-reported teachers' degree of success in implementing curricular goals and mathematics achievement is significant for all the models, while for Grade 5 the association is not significant. However, for the teacher-reported teachers' degree of success in implementing curricular goals the association is significant and highly pronounced in Grade 5. For Grade 9 the association between teacher-reported teachers' success in implementing curricular goals is only significant in quintile 5.

Again, student SES was positively associated with mathematics achievement and this was significant only for the full sample. The student SES coefficient for mathematics (in all models) was positive, meaning that one standard deviation increase in student SES was associated with an increase in mathematics achievement. The school SES (and the square thereof) contributed a significant and substantial impact towards student achievement for mathematics in all the models and in both grades.

Table 8: Teachers' degree of success in implementing curricular goals

	Grade 5			Grade 9		
	Whole sample	Quintile 5	Quintile 1-4	Whole sample	Quintile 5	Quintile 1-4
Principal-reported teachers' degree of success	1.921 (6.285)	-0.958 (9.669)	2.282 (6.233)	11.36*** (4.294)	16.73** (6.742)	10.58** (4.268)
Teacher-reported teachers' degree of success	25.70*** (6.755)	22.38** (9.621)	25.77*** (6.880)	5.594 (4.311)	20.20*** (7.018)	3.261 (4.274)
Student SES	3.918*** (1.317)	3.116 (37.77)	1.840 (2.549)	1.679* (0.994)	18.76 (97.47)	-1.696 (1.611)
Student SES	-2.670 (1.105)	1.942 (13.15)	-5.421*** (1.660)	-0.851 (0.649)	-4.547 (40.08)	-2.466*** (0.925)
School SES	61.28*** (6.431)	100.7*** (12.10)	55.45*** (7.045)	73.94*** (5.937)	69.51*** (9.163)	72.81*** (6.449)
School SES squared	33.07*** (5.345)	11.14 (10.29)	31.05*** (5.712)	43.32*** (4.686)	42.78*** (11.49)	42.48*** (5.143)
Constant	311.6*** (11.49)	303.2*** (29.94)	310.7*** (11.97)	322.4*** (6.450)	291.0*** (58.10)	325.4*** (6.373)
Observations	9194	1873	7321	11394	2104	9290
R-squared	0.427	0.598	0.274	0.470	0.580	0.322

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other controls: Instructional time, Grade enrolment, Economic disadvantage, Area type, Principal qualifications, Principal experience, Principal experience at current school, Teacher's gender, Teacher qualification, Teacher age, Student age, Student gender, Language of test spoken at home.

Tables 9 and 10 report the results of OLS regression models that predict mathematics achievement in Grade 5 and 9 when teachers' absence from school and teachers' late arrival at school are the main variables of interest respectively. For the Grade 9 data the association between principal-reported teachers' absence from school and mathematics achievement is negative in all the models and significant for the full sample and quintile 5, while for Grade 5 the association is not significant in all the models. This probably means that the significance is driven by the quintile 5 data in Grade 9. The association between principal-reported teachers' late arrival and mathematics achievement is also negative and significant for all models of Grade 9, but insignificant for Grade 5. The results on teachers' late arrival for Grade 9 seem to provide modest support for the finding by Gustafsson (2007), and Taylor and Vinjevold (1999) that teacher late-coming has a marked influence on the reduction of instructional time in schools.

However, it appears that the type of school (primary or secondary) influences the type of leadership practice required. According to Pont, Nusche and Moorman (2008), primary schools tend to be smaller in comparison to secondary schools and consequently have different leadership challenges. Principals in small primary schools generally spend more time in the classroom and can closely monitor teachers, hence this could be a reason that the association between teachers' absence and late-coming is not significant for Grade 5.

Table 9: Teachers' absence from school

	Grade 5			Grade 9		
	Whole sample	Quintile 5	Quintile 1-4	Whole sample	Quintile 5	Quintile 1-4
Principal-reported teachers' absence	5.099 (7.934)	9.593 (8.468)	4.890 (8.304)	-11.16** (4.597)	-14.21** (7.107)	-9.978** (4.751)
Student SES	3.942*** (1.336)	1.788 (38.31)	2.128 (2.680)	1.713* (1.000)	15.58 (98.08)	-1.516 (1.588)
Student SES	-2.838** (1.094)	2.208 (13.35)	-5.458*** (1.711)	-0.933 (0.645)	-3.151 (40.25)	-2.480*** (0.907)
School SES	64.60*** (6.816)	106.4*** (12.10)	59.13*** (7.477)	75.49*** (6.008)	76.13*** (10.30)	74.20*** (6.532)
School SES squared	34.11*** (5.743)	8.323 (10.84)	33.00*** (6.307)	44.13*** (4.635)	41.62*** (11.88)	43.27*** (5.061)
Constant	327.6*** (11.88)	315.5*** (28.74)	326.9*** (12.77)	334.5*** (5.395)	319.1*** (58.53)	335.3*** (5.448)
Observations	9017	1858	7159	11337	2100	9237
R-squared	0.417	0.597	0.259	0.469	0.573	0.321

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other controls: Instructional time, Grade enrolment, Economic disadvantage, Area type, Principal qualifications, Principal experience, Principal experience at current school, Teacher's gender, Teacher qualification, Teacher age, Student age, Student gender, Language of test spoken at home.

Table 10: Teachers' late arrival at school

	Grade 5			Grade 9		
	Whole sample	Quintile 5	Quintile 1-4	Whole sample	Quintile 5	Quintile 1-4
Principal-reported teachers' late arrival	-0.135 (10.33)	10.38 (10.63)	-0.268 (10.58)	-11.38** (5.123)	-15.96** (7.842)	-10.31** (5.150)
Student SES	3.944*** (1.336)	2.113 (38.06)	2.243 (2.632)	1.626 (0.998)	19.31 (100.5)	-1.742 (1.594)
Student SES	-2.838** (1.104)	1.940 (13.25)	-5.383*** (1.689)	-0.896 (0.644)	-4.894 (41.40)	-2.501*** (0.906)
School SES	64.02*** (6.855)	107.3*** (12.59)	58.51*** (7.467)	75.05*** (6.065)	74.69*** (10.17)	73.41*** (6.714)
School SES squared	34.32*** (5.708)	8.023 (10.93)	33.20*** (6.244)	44.15*** (4.669)	43.94*** (11.73)	42.99*** (5.203)
Constant	328.2*** (11.77)	315.8*** (28.77)	327.5*** (12.61)	332.0*** (5.263)	314.1*** (59.83)	332.9*** (5.322)
Observations	9017	1858	7159	11394	2104	9290
R-squared	0.416	0.597	0.258	0.468	0.573	0.320

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other controls: Instructional time, Grade enrolment, Economic disadvantage, Area type, Principal qualifications, Principal experience, Principal experience at current school, Teacher's gender, Teacher qualification, Teacher age, Student age, Student gender, Language of test spoken at home.

Table 11 reports the results of the association between the frequency of homework exercises as reported by teachers (a proxy for monitoring of assessment by the school principal) and mathematics achievement. Similar to teachers' absence from school and late arrival at school, it appears that for the frequency of homework exercises given to students, the type of school (primary or secondary) also has an influence on students' academic achievement. Principals in small primary schools generally spend more time in the classroom and can closely monitor teachers, which may be a reason that the association between the frequency of homework exercises and mathematics achievement is positive and significant for Grade 5. In secondary schools, monitoring of teachers is not done directly by the school principal, hence the association between the frequency of homework exercises and mathematics achievement is not significant.

Table 12 reports the results of the association between teachers' satisfaction with the teaching profession (a proxy for teacher motivation) and mathematics achievement. When it comes to satisfaction with being a teacher, in secondary schools there appears to be a positive and significant association with mathematics achievement. This could imply that to achieve better performance in secondary schools, teachers should be highly motivated. Teacher motivation is also important for primary school teachers, but other instructional leadership characteristics, such as monitoring of curricular implementation, appear to be playing a dominant role.

Table 11: Monitoring of curriculum

	Grade 5			Grade 9		
	Whole sample	Quintile 5	Quintile 1-4	Whole sample	Quintile 5	Quintile 1-4
Mathematics homework frequency – everyday or 3-4 times a week	15.06*** (2.879)	17.32** (6.827)	13.94*** (2.984)	6.530 (4.843)	2.939 (7.869)	6.849 (4.879)
Student SES	4.276*** (1.352)	-27.40 (45.87)	2.799 (2.745)	1.748* (1.008)	19.81 (100.6)	-1.964 (1.639)
Student SES	-2.218** (1.122)	13.72 (15.55)	-4.592** (1.841)	-0.779 (0.651)	-4.593 (41.46)	-2.532*** (0.931)
School SES	62.06*** (6.476)	102.3*** (12.50)	58.16*** (7.173)	75.60*** (6.290)	77.01*** (10.68)	73.77*** (6.993)
School SES squared	31.00*** (5.527)	3.957 (11.29)	31.14*** (6.277)	44.16*** (4.683)	42.75*** (11.92)	42.80*** (5.242)
Constant	321.5*** (11.74)	330.0*** (34.58)	321.0*** (12.62)	325.3*** (6.242)	310.9*** (60.12)	325.7*** (6.286)
Observations	7914	1622	6292	11098	2066	9032
R-squared	0.430	0.601	0.272	0.470	0.571	0.321

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other controls: Instructional time, Grade enrolment, Economic disadvantage, Area type, Principal qualifications, Principal experience, Principal experience at current school, Teacher's gender, Teacher qualification, Teacher age, Student age, Student gender, Language of test spoken at home.

Table 12: Teacher motivation

	Grade 5			Grade 9		
	Whole sample	Quintile 5	Quintile 1-4	Whole sample	Quintile 5	Quintile 1-4
Satisfied with being a teacher	4.484 (10.36)	-0.273 (13.15)	8.384 (10.49)	9.507** (4.517)	14.19** (6.260)	8.493* (4.603)
Student SES	3.981*** (1.324)	-0.179 (38.26)	2.394 (2.628)	1.738* (1.003)	18.87 (102.3)	-1.960 (1.592)
Student SES	-2.651** (1.082)	2.887 (13.31)	-5.066** (1.675)	-0.897 (0.647)	-4.470 (42.14)	-2.644*** (0.905)
School SES	63.73*** (6.530)	105.2*** (12.14)	58.21*** (7.181)	74.97*** (6.102)	76.16*** (10.33)	73.38*** (6.870)
School SES squared	34.26*** (5.701)	8.994 (10.63)	33.80*** (6.374)	43.46*** (4.582)	42.69*** (11.52)	42.42*** (5.265)
Constant	323.1*** (14.05)	318.5*** (30.79)	318.4*** (14.70)	322.6*** (6.353)	302.4*** (60.77)	324.5*** (6.359)
Observations	9070	1862	7208	11208	2046	9162
R-squared	0.419	0.595	0.262	0.466	0.575	0.316

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other controls: Instructional time, Grade enrolment, Economic disadvantage, Area type, Principal qualifications, Principal experience, Principal experience at current school, Teacher's gender, Teacher qualification, Teacher age, Student age, Student gender, Language of test spoken at home.

6. CONCLUSION

This paper provided a qualitative account of instructional leadership in South African schools, as well as a quantitative analysis on the association between instructional leadership and student achievement using the TIMSS 2015 dataset. We interviewed primary school principals and foundation phase teachers on their perceptions and practices of instructional leadership in their schools. In the qualitative part of the study, we presented the main themes identified during these interviews. In the quantitative part, we conducted descriptive and linear probability regression analysis on the impact of instructional leadership variables on student achievement in South Africa.

6.1 Qualitative analysis

Findings from the interviews highlighted disparities in instructional leadership practices relative to the socio-economic status of the schools. For instance, most former Model C schools provided teacher replacements when teachers were on leave, while schools in the townships and rural areas did not have the same provision. When schools do not provide teacher replacements or ensure that teachers with free periods stand in for absent teachers, the teaching and learning programme of the school is compromised. This points to weak instructional leadership on the part of school management. Most of the schools interviewed mentioned the disrupting effect of union activity on the culture of teaching and learning in their schools. The perception was predominantly expressed in township and rural schools, with some principals expressing a sense of powerlessness regarding the issue.

Critically for curriculum implementation there appeared to be elements of weak instructional leadership. Curriculum monitoring was conducted largely for compliance purposes without real regard of quality control. Some school principals were not directly involved in supervision of curriculum implementation. They left this function solely to their heads of departments. However, the quantitative TIMSS 2015 analysis showed that monitoring of curriculum implementation had a significant association with academic performance at primary school level due to the small size of most of the primary schools. In a small primary school, the principal is also a class teacher and his or her oversight role is direct rather than indirect. This is indicative of the potentially important role school principals can play in terms of improving student achievement through real curriculum monitoring.

Regarding teacher vacancies, most schools in historically disadvantaged schools only relied on the department for employing teachers. Unlike the former Model C schools, they did not use the SGB funds to fill in vacancies while waiting for permanent appointments by the department.

An effective path for policy could be to explore ways to hire, empower and support principals and heads of departments and to create a culture of accountability to improve instructional leadership and teaching in schools.

6.2 Quantitative analysis

The results of the multivariate analysis from the TIMSS 2015 dataset showed that SES remains the most important correlate of student achievement in South Africa. The models presented indicated that the mean SES within a school was more important for learning than a student's own home background. This can mean that while student SES plays a screening role in determining the quality of schools that students attend, once students have been selected into schools, the role of individual student SES is overshadowed by the school's average SES. The school then becomes the main predictor of student achievement.

The instructional leadership variables such as teachers' understanding of curricular goals and teachers' degree of success in implementing curricular goals were also important correlates of student achievement. However, there seems to be a difference in significance levels depending on whether the questions were answered by principals or teachers. For instance, the association between teachers' understanding of curricular goals was significant when reported by principals at Grade 9 level, whereas it was significant when reported by teachers at Grade 5 level. It is also important to point out that the effects of instructional leadership on student achievement were expressed in other related variables. For instance, the level of qualification of the principal was an important correlate of student achievement. It is expected that principals with higher qualifications possess high instructional leadership skills, and this should translate into higher student achievement. Also, higher teacher qualifications (with first degree or honours) were strong predictors of student achievement. This could be interpreted as such: highly qualified teachers have a greater understanding of and ability to implement the curricular goals and mission of the schools.

References

- Bloom, N., Lemos, R., Sadun, R. & Van Reenen, J. 2015. Does management matter in schools? *Economic Journal*. 125(584):647–674.
- Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 3(2):77–101.
- Bruns, B., Filmer, D. & Patrinos, H.A. 2011. *Making schools work: New evidence on accountability reforms*. Washington, DC: The World Bank.
- Bush, T. 2011. *Theories of educational leadership and management*. 4th ed. London: Sage.
- Bush, T. & Glover, D. 2016. School leadership and management in South Africa: Findings from a systematic literature review. *International Journal of Educational Management*. 30(2):211–231.
- Bush, T. & Heystek, J. 2006. School leadership and management in South Africa: Principals' perceptions. *International Studies in Educational Administration*. 34(4):63–76.
- Bush, T., Joubert, R., Kiggundu, E. & van Rooyen, J. 2010. Managing teaching and learning in South African schools. *International Journal of Educational Development*. 30(2):162–168.
- Carnoy, M. & Chisholm, L. 2008. Towards understanding student academic performance in South Africa: A Pilot Study of Grade 6 Mathematics Lessons in South Africa. (April):1–83.
- Carnoy, Martin., Chisholm, L. & Chilisa, B. 2012. *The low achievement trap: Comparing schooling in Botswana and South Africa*. Cape Town: HSRC Press.
- Chisholm, L., Hoadley, U., wa Kivulu, M., Brookes, H., Prinsloo, C., Kgobe, A., Mosia, D., Narsee, H., et al. 2005. *Educator workload in South Africa*. Cape Town: HSRC Press. [Online], Available: Free download from www.hsrcpress.ac.za Free download from www.hsrcpress.ac.za.
- Christie, P., Butler, D. & Potterson, M. 2007. *Schools that work: Report to the Minister of Education*. Pretoria: Department of Education, South Africa.
- Coleman, J.S., Campbell, E.Q., Hobson, C.J., McPartland, J., Mood, A.M., Weinfeld, F.D. & York, R.L. 1966. *Equality of Educational Opportunity*. Washington, DC: Government Printing Office and National Center for Educational Statistics. [Online], Available: <https://files.eric.ed.gov/fulltext/ED012275.pdf>.
- von Davier, M., Gonzalez, E.J. & Mislevy, R.J. 2009. What are plausible values and why are they useful? *IERI monograph series: Issues and methodologies in large-scale assessments*. 2:9–36. [Online], Available: http://www.ierinstitute.org/fileadmin/Documents/IERI_Monograph/IERI_Monograph_Volume_02_Chapter_Introduction.pdf.
- Department of Basic Education. 2014. *The South African standard for principalship: Enhancing the image of and competency school principals*. Pretoria.
- Department of Education. 1998. *The Employers Education Act*. Pretoria.
- Dong, N. & Cravens, X.C. 2011. Leadership, learning-centered school conditions ,

and mathematics achievement: What can the United States learn from top performers on TIMSS ? *IERI Monograph Series: Issues and Methodologies in Large-Scale Assessments*. 5:79–113.

ECDOE. 2015. *Annual Report 2014/2015: Building blocks for growth*. Zwelitsha.

Elmore, R.F. 2005. Accountable leadership. *The Educational Forum*. 69(2):134–142.

Finch, J. 1987. The vignette technique in survey research. *Sociology*. 21(1):105–114.

Gailmard, S. 2014. Accountability and principal-agent -models. In *The Oxford Handbook of Public Accountability*. M. Bovens, R.E. Goodin, & T. Schillemans, Eds. Oxford, UK: Oxford University Press.

Gill, B.P., Lerner, J.S. & Meosky, P. 2016. Reimagining accountability in K–12 education. *Behavioral Science & Policy*. 2(1):57–70.

Glewwe, P. & Kremer, M. 2006. Schools, teachers, and education outcomes in developing countries. In *Handbook of the Economics of Education*. Vol. 2. E.A. Hanushek & F. Welch, Eds. Amsterdam: North Holland. 945–1017.

Glewwe, P. & Muralidharan, K. 2016. Improving school education outcomes in developing countries: Evidence, knowledge gaps, and policy implications. In *Handbook of Economic of Education*. E.A. Hanushek, M. Stephen, & L. Woessmann, Eds. Armstedam: Elsevier B.V. 653–743.

Gourlay, A., Mshana, G., Birdthistle, I., Bulugu, G., Zaba, B. & Urassa, M. 2014. Using vignettes in qualitative research to explore barriers and facilitating factors to the uptake of prevention of mother-to-child transmission services in rural Tanzania : a critical analysis. *BMC Medical Research Methodology*. 14(21):1–11.

Graczewski, C., Knudson, J. & Holtzman, D.J. 2009. Instructional leadership in practice: What does it look like, and what influence does it have? *Journal of Education for Students Placed at Risk JESPAR*. 14(1):72–96.

Gustafsson, M. 2007. *Using the hierarchical linear model to understand school production in South Africa*.

Hallinger, P. 2003. Leading educational change : reflections on the practice of instructional and transformational leadership. 33(3):329–351.

Hallinger, P. 2005. Instructional leadership and the school principal: a passing fancy that refuses to fade away. *Leadership and Policy in Schools*. 4:1–20.

Hallinger, P. & Heck, R.H. 2010. Collaborative leadership and school improvement : understanding the impact on school capacity and student learning. *School Leadership & Management : Formerly School Organisation* . 30(2):95–110.

Hallinger, P. & Murphy, J.F. 1987.

Heystek, J. 2015. Principals ' perceptions of the motivation potential of performance agreements in underperforming schools. 35(2):1–10.

Hoadley, U., Christie, P. & Ward, C.L. 2009. Managing to learn: instructional leadership in South African secondary schools. *School Leadership & Management*. 29(4):373–389.

Howe, L.D., Hargreaves, J.R. & Huttly, S.R.A. 2008. Issues in the construction of wealth indices for the measurement of socio-economic position in low-income

countries. *Emerging Themes in Epidemiology*. 5:1–14.

Jacobs, L. 2014. Framing of school violence in the South African printed media — (mis) information to the public. *South African Journal of Education*. 34(1):1–16.

Jansen, J.D. 2005. Targeting education: the politics of performance and the prospects of “Education For All”. *International Journal of Educational Development*. 25(4 SPEC. ISS.):368–380.

Kamper, G. 2008. A profile of effective leadership in some South African high-poverty schools. *South African Journal of Education*. 28(1):1–18.

Kruger, A. 2003. Instructional leadership : the impact on the culture of teaching and learning in two effective secondary schools. *South African Journal of Education*. 23(3):206–211.

LaRoche, S., Joncas, M. & Foy, P. 2016. Sample design in TIMSS 2015. In *Methods and Procedures in TIMSS 2015*. M.O. Martin, I.V.S. Mullis, & M. Hooper, Eds. Boston: International Association for the Evaluation of Educational Achievement (IEA). 3.1-3.37.

Leithwood, K., Patten, S. & Jantzi, D. 2010. Testing a conception of how school leadership influences student learning. *Educational Administration Quarterly*. 46(5):671–706.

Madubula, N. 2008. Financing of basic education. In *Technical Report: Annual Submission on the Division of Revenue 2009/10 2009/08*. T. Ajam, B. Khumalo, R. Mabugu, & B. Setai, Eds. Pretoria: Financial and Fiscal Commission. 121–148.

Malcom, C., Keane, M., Hoohlo, L., Kgaka, M. & Ovens, J. 2000. *Why some “disadvantaged” schools succeed in Mathematics and Science? A study of “feeder” schools*. Pretoria: Department of Education, South Africa.

Mavuso, M.P. 2013. Education district office support for teaching and learning in schools : The case of two districts in the Eastern Cape. University of Fort Hare.

Moletsane, R., Juan, A., Prinsloo, C. & Reddy, V. 2015. Managing teacher leave and absence in South African rural schools. *Educational Management Administration & Leadership*. 43(3).

Mortimore, P. 1993. School effectiveness and the management of effective learning and teaching. *School Effectiveness and School Improvement*. 4:290–310.

Mosoge, M. & Pilane, M. 2014. Performance management: the neglected imperative of accountability systems in education. *South African Journal of Education*. 34(1):1–18.

Mulford, B. & Silins, H. 2003. Leadership for organisational learning and improved student outcomes - What do we know? *Cambridge Journal of Education*. 33:157–183.

Muralidharan, K., Das, J., Holla, A. & Mohpal, A. 2017. The fiscal cost of weak governance: Evidence from teacher absence in India. *Journal of Public Economics*. 145:116–135.

NEEDU. 2013. *NEEDU National Report 2012: Summary*. Pretoria: National Education Evaluation and Development Unit. [Online], Available: <http://www.saqg.org.za/docs/papers/2013/needu.pdf>.

- NEEDU. 2014. *NEEDU National Report 2013: Teaching and learning in rural primary schools*. Pretoria: National Education Evaluation and Development Unit.
- Ngcobo, T. & Tikly, L.P. 2010. Key Dimensions of Effective Leadership for Change: A Focus on Township and Rural Schools in South Africa. *Educational Management Administration & Leadership*. 38(2):202–228.
- Nkonki, V.J.J. & Mammen, K.J. 2012. Implementation of the Integrated Quality Management System and educators' perceptions, concerns and dispositions. 31(3):329–336.
- Nkosi, B. 2015. Eastern Cape education department aims to improve. *Mail & Guardian*, 11 December 2015. 11 December.
- O'Donnell, R.J. & White, G.P. 2005. Within the accountability era: principals' instructional leadership behaviors and student achievement. *NASSP Bulletin*. 89(645):56–71.
- Pampallis, J. 2008. *School fees*. Johannesburg: Centre for Education Policy Development (CEPD).
- Reddy, V., Prinsloo, C., Netshitangani, T., Moletsane, R., Juan, A. & van Rensburg, J. 2010. *An investigation into educator leave in the south african ordinary public schooling system*. Pretoria. [Online], Available: <http://www.adoptaschool.org.za/wp-content/uploads/2012/10/HSRC-School-Attendance-Report.pdf>.
- Republic of South Africa. 1996. *South African Schools Act 84 of 1996*. South Africa.
- Republic of South Africa. 2011. *National Development Plan: Vision for 2030*. Pretoria: National Planning Commission. [Online], Available: [http://www.npconline.co.za/medialib/downloads/home/NPC National Development Plan Vision 2030 -lo-res.pdf](http://www.npconline.co.za/medialib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf).
- Republic of South Africa. 2013a. *Report on the national school monitoring survey 2011*. Pretoria: Department of Basic Education.
- Republic of South Africa. 2013b. *Atlas of education eistricts in South Africa*. Pretoria: Department of Basic Education.
- Republic of South Africa. 2015. *Action plan to 2019: Towards the realisation of schooling 2030*. Pretoria: Department of Basic Education.
- Robinson, V., Lloyd, C. & Rowe, K. 2008. The impact of leadership on student outcomes: an analysis of the differential effects of leadership types. *Educational Administration Quarterly*. 44(5):635–674.
- Robson, C. 2011. *Real world research: A resource for users of social research methods in applied settings*. 3rd ed. Padstow: Wiley.
- Ruebling, C.E., Stow, S.B., Kayona, F. a. & Clarke, N. a. 2004. Instructional leadership: an essential ingredient for improving student learning. *The Educational Forum*. 68(3):243–253.
- Spaull, N. 2011. *A Preliminary analysis of SACMEQ III South Africa*. (11).
- Spaull, N. 2012. *Poverty & Privilege : Primary School Inequality in South Africa*. (Stellenbosch Economic Working Papers 13/12).
- StataCorp. 2013. *Stata Base Reference Manual*.

- Taylor, S. 2011. *Uncovering indicators of effective school management in South Africa using the National School Effectiveness Study*. (10/11).
- Taylor, N. & Vinjevold, P. 1999. Teaching and learning in South African schools. In *Getting learning right: report to the President's education initiative project*. N. Taylor & P. Vinjevold, Eds. Braamfontein: Joint Education Trust. 131–162.
- Taylor, S. & Yu, D. 2009. The importance of socio-economic status in determining educational achievement in South Africa. *Stellenbosch Economic Working Papers*. [Online], Available: <http://www.ekon.sun.ac.za/wpapers/2009/wp012009/wp-01-2009.pdf>.
- Taylor, N., Mabogoane, T. & Akoobhai, B. 2011. *Service delivery research project office of the Presidency: the school sector*.
- Taylor, N., Van der Berg, S. & Mabogoane, T. 2013. Creating effective schools. N. Taylor, S. Van der Berg, & T. Mabogoane, Eds. Cape Town: Pearson. 196.
- Van der Berg, S. 2007. Apartheid 's enduring legacy : inequalities in education. *Journal of African Economies*. 16(5):849–880.
- Van der Berg, S. 2008. How effective are poor schools? Poverty and educational outcomes in South Africa. *Studies in Educational Evaluation*. 34(2008):145–154.
- Weber, E. 2005. New controls and accountability for South African teachers and schools: The Integrated Quality Management System. *Perspectives in Education*. 23(2):63–72.
- Wills, G. 2015. Informing principal policy reforms in South Africa through data-based evidence. 5(2):95–122.
- World Bank. 2018. *Learning to realize education's promise*. Washington, DC: World Bank Group.

Appendix

Table A 1: Variables used in estimation of SES index and weights

Variable	Asset ownership	Grade 5 weights	Grade 9 weights
Cell phone	Yes	0.818	0.446
	No	-1.148	-1.898
Computer or tablet	Yes	1.533	1.536
	No	-0.657	-0.731
Shared computer or tablet	Yes	1.069	0.936
	No	-0.822	-0.717
Internet connection	Yes	1.599	1.024
	No	-0.866	-1.293
Gaming system	Yes	1.485	1.560
	No	-0.945	-0.731
Own room	Yes	1.018	0.595
	No	-1.101	-1.309
Study desk	Yes	0.839	0.652
	No	-1.174	-1.050
Electricity	Yes	0.419	0.334
	No	-2.233	-3.472
Running tap water	Yes	0.711	0.647
	No	-1.291	-1.899
Television	Yes	0.354	0.350
	No	-2.840	-3.847
Dictionary	Yes	0.716	0.499
	No	-1.476	-1.911
Number of books	More than 25 books	1.601	1.182
	0-25 books	0.412	-0.309
Number of devices	More than 3 devices	1.396	1.114
	0-3 devices	0.483	-1.239

Table A 2: Socio-demographic characteristics of total sample in percentage

	Grade 5	Grade 9
Principal-reported teachers' understanding of curricular goals	N=10705	N=12475
Very high	23.2	16.3
High	56.1	60.0
Medium	19.8	28.7
Low	0.9	2.0
Teacher-reported teachers' understanding of curricular goals	N=10583	N=12206
Very high	24.9	29.4
High	58.1	54.0
Medium	16.3	15.3
Low	0.7	1.3
Principal-reported teachers' degree of success in implementing curriculum	N=10663	N=12434
Very high	13.6	11.8
High	48.3	41.2
Medium	36.4	43.7
Low	1.6	2.9
Very low	0.1	0.4
Teacher-reported teachers' degree of success in implementing curriculum	N=10337	N=12173
Very high	22.9	19.9
High	54.5	51.6
Medium	22.5	26.4
Low	0.1	2.1
Principal-reported teachers' absence from school	N=10626	N=12441
Not a problem	31.7	25.7
Minor problem	51.8	47.2
Moderate problem	13.9	21.8
Serious problem	2.6	5.3
Principal-reported teachers' late arrival at school	N=10626	N=12513
Not a problem	47.6	35.4
Minor problem	41.9	46.7
Moderate problem	9.4	13.6
Serious problem	1.1	4.3
Frequency of Mathematics homework assigned	N=9324	N=12039
No homework	2.4	2.2
Everyday	37.5	56.7
3 or 4 times a week	32.0	31.5
1 or 2 times a week	22.2	9.1
Less than once a week	5.9	0.5
Teacher-reported satisfaction with being a teacher	N=10645	N=12234

Very often	61.6	39.8
Often	22.6	34.0
Sometimes	13.3	23.2
Never or almost never	2.6	3.0
Students who speak English at home	N=10781	N=12416
Always	20.5	21.0
Almost always	10.4	14.0
Sometimes	56.8	60.0
Never	12.3	5.0
Student gender	N=10918	N=12506
Girl	48.8	51.3
Boy	51.2	48.6
Students taught by teachers per teachers' gender (n=12310/12514)	N=10640	N=12310
Female	63.4	44.6
Male	36.6	53.8
Total experience of the principal (n=11555/12514)	N=9781	N=11555
0 to 5 years	32.7	39.6
6 to 15 years	40.0	28.1
More than 15 years	27.3	24.6
Total experience of the principal at present school (n=11424/12514)	N=9770	N=11424
0 to 5 years	40.1	46.8
6 to 15 years	38.3	25.9
More than 15 years	21.7	18.6
Students taught by teachers per teachers' age categories	N10640	N=12383
Under 25 years	3.1	5.3
25 to 29 years	6.9	17.7
30 to 39 years	13.7	24.0
40 to 49 years	48.0	34.2
50 to 59 years	25.4	15.5
60 years or more	2.9	2.2
Principal qualification	N=10393	N=12153
Did not complete Bachelor's or equivalent	22.7	7.1
Bachelor's or equivalent	66.2	77.6
Master's or equivalent	10.1	10.7
Doctor or equivalent	1.0	1.7