SCHOOL MANAGEMENT AND EDUCATIONAL PERFORMANCE:

An Analysis of 14 Public Schools in the Western Cape

By

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PLAGIARISM DECLARATION

I undertake that all material presented for examination is my own work and has not been written for me, in whole or in part by any other person. I undertake that any quotation or paraphrase from the published or unpublished work of another person has been duly acknowledged and I have used the American Psychological Association (APA) as the convention for citation and referencing in the work which I now present for examination

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ABSTRACT

Education has come to the fore in development policy and as such has sparked a great deal of research on the relative importance of educational inputs. While school resources and family attributes are often the focus of such work, there are a number of papers exploring the significance of the impact of school management on learner test results. However, much of the quantitative research is inconclusive. This is largely due to the non-standardized and subjective measurements of management that have been used.

This dissertation proposes the use of the Institutional Analysis and Design framework of Ostrom and colleagues (1990; 1994; 2005; 2009) as a means of benchmarking school management. The core components of the IAD framework are used to create a series of management indices for a sample of schools in the Western Cape. The paper finds, through a series of statistical approaches, that management is a significant input into the school production function and may be more important than other, previously emphasized, inputs.

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LIST OF ACRONYMS

CPR……..	Common Pool Resource
DET……..	Department of Education and Training
EPF……..	Education Production Function
GDP…….	Gross Domestic Product
HIB……..	High International Benchmark
HOR…….	House of Representatives
IAD…….	Institutional Analysis and Design
LIB……	Low International Benchmark
MDG…….	Millennium Development Goals
OLS……	Ordinary Least Squares
RCT……..	Random Control Trail
RD…….	Regression Discontinuity
REQV…….	Relative Education Qualification Value
SASA……	South African Schools Act
SES……	Socio-Economic Status
SGB……..	School Governing Board
SMT……..	Senior Management Team
SPADE……	Schools Performing Above Demographic Expectations
WCED……	Western Cape Education Department

CHAPTER 1 Literature Review

1.1 WHY IS EDUCATION IMPORTANT?

> *'Education is development. It creates choices and opportunities for people, reduces the twin burdens of poverty and diseases, and gives a stronger voice in society. For nations it creates a dynamic workforce and well-informed citizens able to compete and cooperate globally – opening doors to economic and social prosperity'*
>
> (World Bank, 2004)

Many economists have acknowledged that education, and the human capital that it generates, is a crucial input for economic growth (Barro & Lee, 2000; Lucas, 1988; Mankiw, Romer, & Weil, 1992). As workers obtain higher levels of education they become more skilled and productive and are able to increase the output of goods and services in an economy (Barro & Lee, 2000). Several economists have estimated the benefits of education to society: In the United States, Denison (1967; 1979) found that between 10 and 15 per cent of real income growth is directly attributable to education (a similarly large result for the USA was also found by Shultz (1960)). The link between education and economic growth is not unique to the United States and de Meulemeester and Rochat (1995) find Granger-causality running from higher education to economic development (measured by GDP per capita) in Japan, France, the United Kingdom and Sweden. Further, education has been shown to be directly related to agricultural output and Jamison and Lau (1982) estimate that an additional year of education for the head of an agricultural household raises output by approximately 2 per cent for that household. Yang (2004) also finds evidence that in China schooling enhances the ability of farmers to devote labour and capital to non-agricultural production (industries and services) and that the expansion of nonfarm activities can contribute significantly to household income growth.

At the national level there are further nonmarket benefits from education and these include the stabilization of democracy (Barro, 1999; Glaeser, Ponzetto & Shleifer, 2006), the reduction of criminal activity (Lochner & Moretti, 2001; Lochner, 2008; Ehrlich, 1975; Buonanno & Leonida, 2009) and increased concern for environmental sustainability. Aside from country level benefits, education also directly benefits the individual who invests in it: Psacharopoulos (1994) estimated that the rate of return to education is approximately 10 per cent per annum and is higher in developing countries, especially those with skill shortages (typified by South Africa). The private benefits of education have been well established and include better employment prospects, higher salaries, and a greater ability to save and invest. These benefits may result in better health, lower fertility rates and improved quality of life (Barro, 1999; Grossman, 2005; Michael, 1973).

With such evidence as to the advantages of investment in education there is little doubt that a country's education system should be a key priority and that a well-functioning system is likely to result in a plethora of country- and individual-level benefits. Policies makers agree with this sentiment and in recent years education has become a major international focus resulting in one of the eight Millennium Development Goals (MDG) set forward by the United Nations being to 'achieve universal primary school enrolment' by 2015. However, there is still the question of whether increased enrolment rates or increased average years of education will lead to 'improved' education. School enrollment does not capture the effect of drop-outs or repeaters and years of schooling assumes a year of schooling produces the same amount of student achievement, or skills, over time. In short these measures show the *quantity* of education, however, the quality of education in developing countries is low in the sense that children do not leave school having learnt all that the curriculum states they should (Glewwe & Kremer, 2005; Lockheed & Verspoor, 1991; Harbison & Hanushek, 1992). Often data is limited and quantity of education is the only measure available. However, recent rounds of international testing have given a means to proxy for international educational quality. Hence, in the following section the literature on South Africa's *quality of education* in an international context is discussed.

1.2 South African Learner Performance

1.2.1 Learner performance in a global context

Since the end of apartheid the South African government has invested large sums of money in education. The expenditure on education, relative to both the country's GDP and the total budget, is high (in 2011 21 per cent of the national budget, close to R200 billion, was allocated to education). However, the system continues to produce largely poor quality outcomes as well as low private and social returns to individuals and the economy. (Taylor N. , 2008) Although educational access is no longer a problem in South Africa with more than 90 per cent of children from all race groups remaining at school until obtaining a matric or reaching the age of 16 (van der Berg, 2002), a series of international studies have established that weak learner performance and low educational attainment continues to be a feature of South African's schooling system (Chrisholm, 2004), even when compared to other developing countries. Analysis of four international datasets namely: the Trends in Mathematics and Science Study (TIMSS), the Progress in International Reading Study (PIRLS), the Monitoring Learning Achievement Project (MLA) and the Southern Africa Consortium for Monitoring Educational Quality studies (SACMEQ II and III) have illustrated that this trend is presence in both primary and high schools.

The MLA project was completed in 1999 and measured the competencies of Grade 4 learners in 12 African countries in 3 areas: numeracy, literacy and life skills. South African learners obtained averages of less than 50 per cent for all

areas and were ranked the lowest of the 12 participating countries in numeracy, the fifth lowest in literacy and the third lowest in life skills (Department of Education, 2009). Almost 45 per cent of learners achieved below 25 per cent in the numeracy test indicating numerical incompetence. This ineptitude was re-affirmed in the TIMMS which South Africa participated in, in 1999 and again in 2003. This study focused on Grade 8 learning achievement in science and mathematics. South African learners performed poorly registering the lowest mean scores in both mathematics and science out of 38 countries (including Morocco and Tunisia) in 1999 and out of 50 countries (including Botswana, Ghana, Morocco, Tunisia and Egypt) in 2003 (Taylor & Yu, 2009). The South African average scores were in the range of about half the international average score with less than 10 per cent of students reaching the low international benchmark (LIB) of 400 points out of a possible 800 and less than 1.5 per cent reaching the high international benchmark (HIB) of 500 points (Department of Education, 2009).

PIRLS (2006) was an international study (which included 40 countries) which measured reading literacy among Grade 4 learners. Again South African results were very poor and the country ranked the lowest out of 40 countries in terms of reading ability (Howie, et al., 2008). Additionally, only 13 per cent of Grade 4 learners and 22 per cent of Grade 5 learners reached the LIB level for Grade 4. This is in sharp contrast to the international data where the median for learners who reached the LIB was 94 per cent. Additionally almost all those who tested in African languages failed to reach the LIB – illustratively, 1 per cent of isiNdebele, Siswati and isiXhosa learners reached the LIB in Grade 4 and not one African language learner was able to reach the HIB (Department of Education, 2009). Furthermore, in the lowest quintile the average reading score was found to be 108. Considering that much of the test was in multiple-choice format and that the LIB is 400, it becomes clear that many primary school learners in South Africa are effectively illiterate (Taylor & Yu, 2009).

South Africa was the only African country besides Morocco to be included in the PIRLS, however, even when compared with other sub-Saharan countries South African test scores are ranked very low. South Africa has participated in two SACMEQ studies, SACMEQ II (2001) and SACMEQ III (2007) which focused on Grade 6 learners in 14 sub-Saharan countries. South Africa lies in the bottom half of these countries in terms of both mathematics and reading scores despite much higher expenditure on education (van der Berg, 2008). Furthermore, South Africa ranks lower than Mozambique, Kenya, Tanzania and Uganda who have GDPs ranging from one fifth to one tenth of South Africa's (Taylor N., 2008). When controlling for socio-economic differences South Africa's literacy and numeracy scores fall close to the bottom and are well below the regional average (Ross and Zuze, 2004; Moloi and Chetty, 2010).

The analysis of these four international datasets illustrates that the South African education system has been unable to produce educational outcomes in line with the international mean in both primary and high school and in all subjects.

The consistantly low scores revealed by studies have certainly increased the level of debate about education in the media and academia and it has become clear that there is a need to be concerned about learner perfomance in the country (Reddy, 2005). In addition, South African learners' scores in all the data sets were often much more varied than any other participating country's with scores "ranging from a preponderance of very low scores to a few very high scores" (Reddy, Kanjee, Diedericks, & Winnaar, 2006, p. 112). Research indicates that the variation is due to the large discrepencies between results in the top quintile and the preceeding quintiles which suggest that high socio-economic status (SES) (which in turn is closely related to race) may be a key determinant of high learner educational attainment (van der Berg, 2008; 2002).

1.2.2 Learner performance in terms of SES and former department

The deeply entrenched legacy of apartheid has resulted in an enduring correlation between wealth (which is still largely distributed according to race) and academic performace leading to a high intraclass correlation coeffcient (rho) which reflects a far greater level of between-school variance then most countries (van der Berg, 2008). Hence school results follow a constant, statistically bimodal distribution which tells the 'tale of two schools' (Spaull, 2011) with the vast majority of learner results grouped at the low end of the scale while a small group achieves at the higher end (Fleisch, 2008). This bimodal pattern has been uncovered in both international and national assessments in primary and high schools. The figures below illustrate how both numeracy and reading scores from the SACMEQ III study are influenced by school SES level. Figure 1 below illustrates how reading scores are largely bimodal and strongly associated with school wealth. Hence the bottom quintiles yield reading scores which are distinctly lower than the schools in the fifth quintile. The pattern is mimicked for numeracy scores, shown in Figure 2, with the lower four quintiles all peaking at a much lower point than the richest quintile. Comparitively, the fifth quintile of South African schools was only outperformed by Mauritius and Kenya whereas the South African mean scores in quintiles one through four fell below the SACMEQ all-country mean (Taylor N., 2008).

What is of further interest is that the bottom quintiles all perform at a similar level. Van der Berg (2002) argues that there is an SES 'threshold level' below which reading and mathematics scores do not improve much with incremental increases in SES. This threshold could be as high as the 4th quintile as the only real observable difference in results is in the top quintile whose SACMEQ results are a full quarter higher than the rest of the country. It appears that South African schools are unable to turn higher SES into an educational advantage and that in many cases even middle class children are not achieving at the required level (van der Berg, 2002).

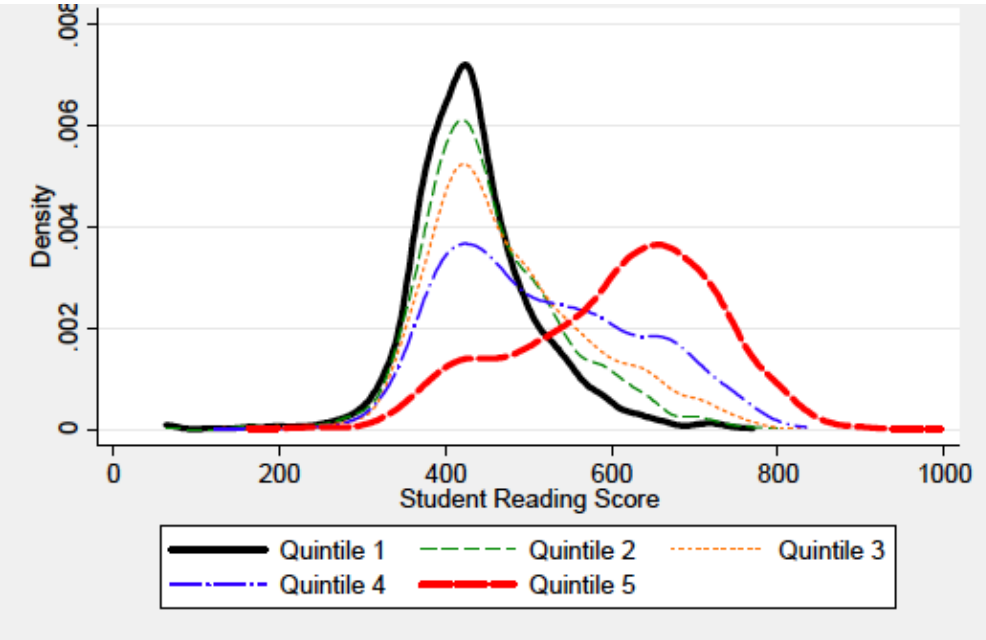


Figure 1: Kernel density of student reading scores by quintile

Source: SACMEQ III South Africa

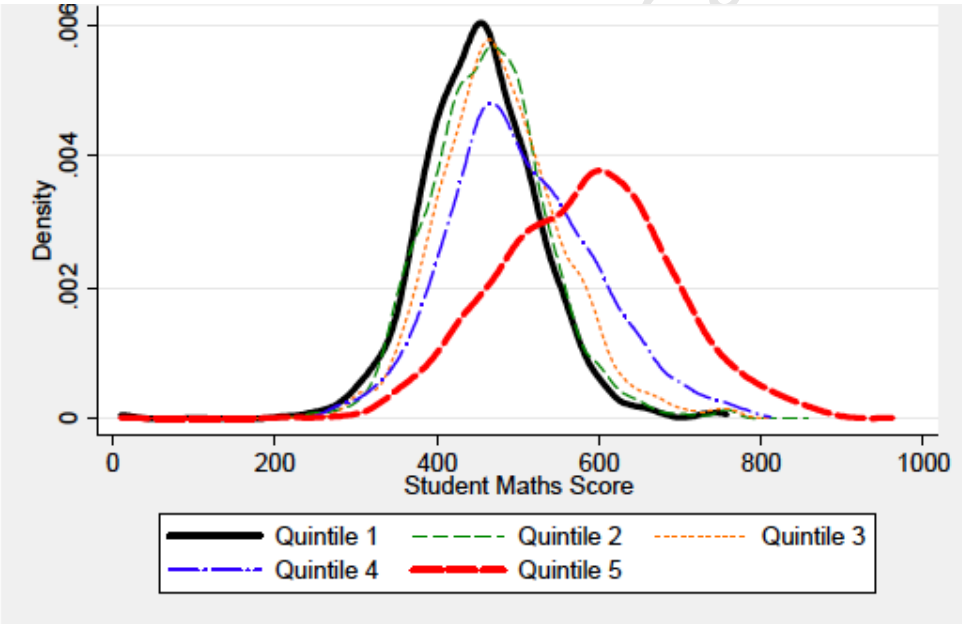


Figure 2: Kernel density of student math scores by quintile

Source: SACMEQ III South Africa

The bimodal pattern is also evident when comparing schools across former departments and this reflects the fact that the bulk of the educational performance disparity is between formerly disadvantaged and formerly advantaged

schools. Therefore, formerly black (Department of Education and Training (DET)) and coloured (former House of Representatives (HOR)) schools obtain much lower scores than previously white and Indian schools. Table 1 below shows the 2003 and 2005 Grade 6 literacy pass rates in the Western Cape by former department and illustrates succinctly how results are heavily influenced by schools' former-department.

Table 1: Western Cape literacy pass-rates by former department

Ex-Department	Grade 6		% Distribution of Learners by Ex-Department	
	2003	**2005**	**2003**	**2005**
CED	82,9	86,9	20,1	21,2
DET	3,7	4,7	13,6	14,3
HOR	26,6	35,5	65,8	64,2
Total Province	35	42,1	100	100

Source: Taylor, 2008

More than four out of every 5 children in former white schools are achieving at the appropriate level whereas only a third of all children in former coloured schools achieve at this level. More disturbingly, at former-DET schools less than 5 children out of each hundred were reading at the required level (Taylor N. , 2008). This indicates how Mbeki's 'parallel economies' (1998) have found real purchase in the South African education system.

1.3 Factors that contribute to academic achievement

The school system in South Africa has thus far been unable to overcome the persistence of poor educational results in historically disadvantaged schools. This has resulted in low human capital attainment for the vast majority of the country, prohibiting upward mobility and perpetuating inequality in the labour market (van der Berg, 2002). There is a plethora of international and South African literature that attempts to pinpoint which factors are most responsible for better results in some schools as opposed to others. Factors which are recurrent in the literature are: resources, teacher quality, school management and family effects.

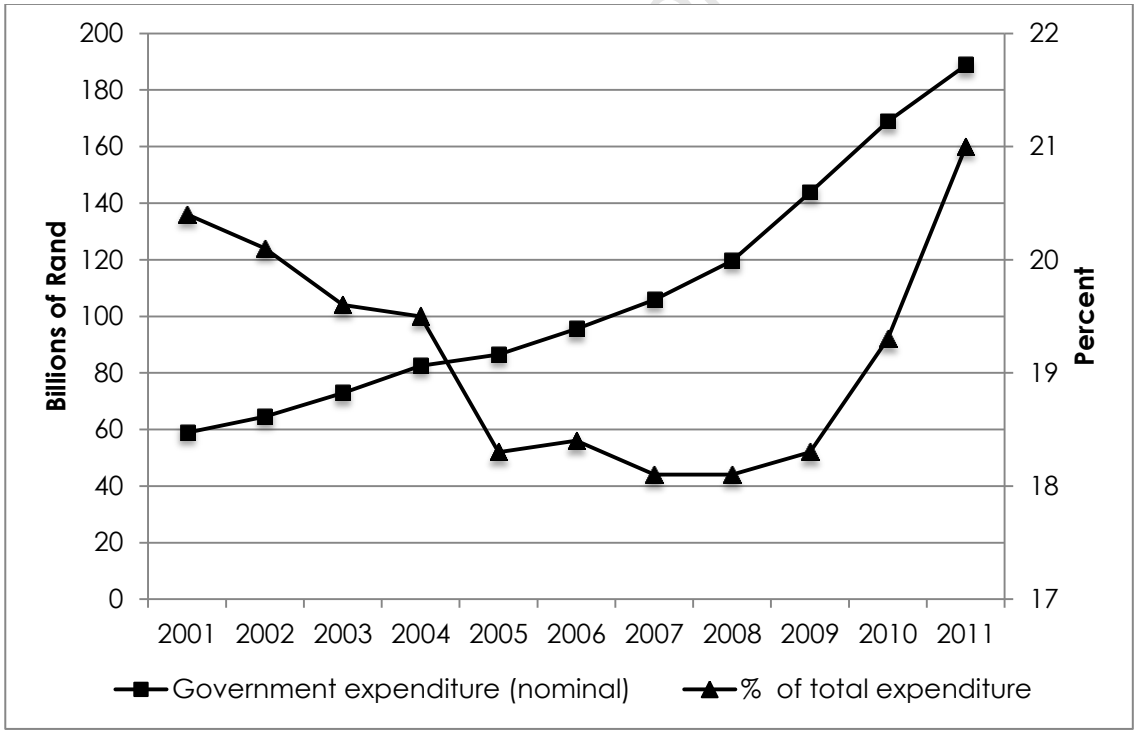
The existing literature on each of these factors as contributors to results as well as how they stand in South African schools will be reviewed below.

1.3.1 Resources

1.3.1.1 Resources in South African Schools

In the post-apartheid years, South Africa allocates a large (and increased) percentage of its budget towards education spending. There have also been substantial resource shifts to formerly disadvantaged schools: during the height of apartheid the government spent approximately 19c on black pupils for every R1 spent on white pupils, yet just 3 years after the demise of the apartheid regime black pupils received R1.41 for everyone R1 spend on white pupils (Bhorat & Oosthuizen, 2008). Figure 3 below shows the upward trend of expenditure on education from 2001. It also shows that education expenditure accounts for a large proportion of the national budget and over the last five years it has become increasing significant. However, despite massive resource shifts to formerly disadvantaged schools, the number of successful matriculants and university exemptions has actually declined even as the size of the school going population has increased (van der Berg, 2002). Addtionally, there are several former-DET primary and high schools which achieve good results despite their limited resources while some well-resourced schools perform poorly which indicates that there is no deterministic pattern between performance and financial resources in South Africa (Taylor N., 2008).

Figure 3: Education expenditure in South Africa 2001-2011



Source: SARB (2012)

This insignificant relationship between government spending and school results is not uncommon in the literature and most studies uncover inconclusive evidence of a positive effect of government spending on educational attainment (Landau, 1986; Noss, 1991; Flug, Spilimbergo and Wachtenheim, 1998; Bruns, Filmer, & Patrinos, 2011) although Anyanwu et al. (2007) estimate that a increase of 10 per cent in government expenditure on education would increase primary school enrollment levels by 21 – 28 per cent in Africa. Even so, there is little research on how *student results* in Africa are affected by public spending. Gupta et al. (2002) argue that the frequently insignificant effect of government spending on educational attainment may be due to a crowding out effect or to the inefficient and inequitable use of public resources. The latter view is shared by van der Berg (2002) who argues that the South African schooling system is subject to X-inefficiency rather than allocative inefficiency. Because of this, further reallocation of resources between levels of education is likely to bring little educational gain. An example of this X-inefficiency is demonstrated by the high growth of teacher salaries coupled with only a small decrease in the pupil-teacher ratio. Whilst financial flows to poor schools have increased hugely over the last 2 decades, the major result has been increased teacher salaries due to the strong bargaining power of teacher unions. Thus while spending on educational personnel has increased, it has not been coupled with an increase in personnel numbers and has crowded out spending on non-personnel based resources (Wildeman, 2008). In this way the large increases in expenditure have been used in a fashion that is arguably inefficient.

In the next section, current research on the *types* of resources that have been found to be significant in the attainment of academic results in South Africa and elsewhere will be discussed.

1.3.1.2 THE ROLE OF RESOURCES IN EDUCATIONAL ATTAINMENT

In the past, two strands of research – education production function (EPF) and randomized control trial (RCT) research - have focused extensively on the role of *resources* in educational attainment. *Resource measures* that tend to be assessed are the teacher-pupil ratio, teacher quality (this will be dealt with in the section 1.3.2) and measures of other resources in a school (including facilities and administrative inputs) (Hanushek, 1997).

Hanushek's (1995) review of 96 EPF studies in developing countries concludes that the relationship between school resources and test scores is tenuous at best. The most common variable used to determine this effect is a teacher-pupil ratio. Of 30 studies which test the effect of teacher-pupil ratio on education he finds only 8 cases where the coefficient is both statistically significant and positively signed. The lack of evidence for smaller classes is also found in his analysis of developed countries where he finds that less than 15 per cent of past studies have resulted in a statistically significant positively signed coefficient for teacher-pupil ratio (Hanushek, 1997). Further, in a European study

(Wöβmann, 2003), class size was found to be statistically positively related to mathematics scores– that is students in bigger classes achieve better results - in 12 school systems and was not found to be statistically negatively related to mathematics scores in any country. Much South African data reinforces the finding that decreasing the pupil-teacher ratio does not seem to have any significant effect on test scores (van der Berg, 2002; Crouch and Mabogoane, 2001; Bhorat and Oosthuizen, 2008).

Some argue that this inconclusive evidence is due to econometric issues when using the EPF method, specifically ommitted variable bias (for example, the presence of more resources in a school could actually be a result of a more involved parent body – this would lead to an upward bias) (Kremer & Duflo, 2003). RCT studies, if correctly specified, can overcome the issue of ommited variable bias through random selection. Treatment schools are randomly selected from a pool of schools with identical attributes so that the treatment and control groups only differ in terms of the actual treatment. There are a growing number of RCT studies focused on the effect of increasing the number of teachers at a school. An example is an RCT run in India where a second teacher was randomly assigned to 21 out of 42 non-formal education centers. While the presence of a second teacher did result in the school being closed less often it had no measureable effect on test scores (Banerjee, Jacob, & Kremer, 2002). Therefore, both the RCT and EPF approach seem to indicate that a smaller pupil-teacher ratio is not necessarily likely to result in improved test scores.

However, despite this evidence, Case and Deaton (1999) find a counter suggestion in their analysis of apartheid era South African schools. They use data collected in 1993 and argue that the tight migration controls in place as well as the highly centralized funding of black schools coupled with the wide variation of pupil-teacher ratios across black schools at the time creates a 'natural experiment'. The main finding is that a decrease in the pupil-teacher ratio form 40 to 20 pupils per teacher increases years of completed schooling from 1.5 to 2.5 years and also increases enrollment rates for black pupils only. Additionally they found that this decrease increases reading scores by an equivalent of two additional years of schooling, although it had no significant effect of learner mathematics scores. Case and Deaton are not alone in their finding of a positive relationship between smaller class sizes and higher test scores and several other studies, particularly RCTs and natural experiments have found similar results. The largest of these is the Tennessee STAR project which included 11600 kindergarten learners and started in 1985. Learners were randomly assigned to small (13 – 17 leaners) or regular (22 – 25 learners) classes where after their results were assessed once a year over the next four years. Krueger (1999) finds that learners in smaller classes had test results which were, on average, 4 percentile points higher than those in larger classes after the first year and that results for learners in smaller classes increased by about 1 percentile point per year relative to those in regular classes. This result is re-affirmed by Angrist and Lavy's (1999) paper which uses the natural experiment formed by schools' subscription to Maimonides' Rule in Israel. This rule states that a class cannot be larger than 40 and so when a class grows past this size it is divided into two smaller classes (therefore a grade with 40 students will have only one class but a grade with 41 students will have

two classes, one of 20 students and another of 21). Angrist and Lavy use regression discontinuity (RD) design and find a clear association between smaller class sizes and test score, particularly in mathematics. However, a more recent paper by Urquiola and Verhoogen (2009) which employs a similar RD design in Chilean private schools where a form of Maimonides' Rule is used, finds that parents value smaller classes. This means that those learners found in smaller classes tend to come from richer, and more educated families which explains at least some of the differences in test scores.

The empirical literature on class size and test scores does not reach a strong conclusion. Both EFPs and RCTs offer mixed evidence on the effect of smaller classes. Therefore, the only conclusion that can be drawn from the literature is that there is no clear, systematic relationship between pupil-teacher ratio and student outcomes (Hanushek, 2007).

Other resources, besides the quantity of teachers in a school that are often cited in the literature can be divided into learning and non-learning resources. Non-learning resources include the school buildings and facilities (such as electricity and water) as well as administration resources. Learning resources include libraries, textbooks and other inputs used in relation to teaching and learning. In developed countries these types of resources seem to have very little effect on test scores with administrative resources and facilities shown to be statistically significant and positively signed only 12 and 9 per cent of the time respectively in American EPF studies (Hanushek, 1997). However, schools with a *significant* shortage of resources often perform worse than those with adequate resources and these differences can be quite large. For example, in England, students without a shortage of learning materials perform 30.5 test-score points higher than those with significant shortages (Wöβmann, 2003).

In developing countries, studies have shown facilities to be statistically significant and positive in a large amount of cases (22 cases out of 34) (Hanushek, 1995). An analysis of SACMEQ III in South Africa (Spaull, 2011) which used a 'school equipment' index and a 'school building' index found neither of these to be significant for numeracy or literacy scores. However, other studies have uncovered the importance of non-indexed resources suggesting that not all resources are equal. In South Africa, Bhorat and Oosthuizen's (2008) study of the determinants of Grade 12 pass rates finds several non-learning infrastructure variables to be significantly related to school performance. Some of these, such as computers for administration purposes and access to telephones, may show that administrative efficiency is a key factor in shaping the success of a school a point that has been frequently argued in the South African literature. Bhorat et al. (2008) also find some learning infrastructure variables significant and robust, especially the presence of a school library and computers for instruction. The mean pass rate for schools without a library was 47 per cent compared to 66 per cent for those with a library. Crouch and Mabogoane (2001) also find these two variables to be of some importance in their analysis of the 1997 matric results in South Africa and Case and Deaton (1999) find the presence of a secondary school library to be significant and particularly large. The significance

of these two variables is largely consistent in the developing country literature: A study in Ghana found that the presence of a school library raised the average school reading score by 0.3 standard deviations and the mathematics score by 1.2 standard deviations (Glewwe & Jacoby, 1992) while an RCT in India showed that a computer-assisted learning program improved mathematics scores by 0.35 standard deviations in the first year and 0.47 standard deviations in the second year (Banerjee, Cole, Duflo, & Linden, 2005). However, it is important to note that it was the specific utilization of the computers and not just their presence that caused the increase in test scores. It is also likely that the technology was substituting for weak teachers as a similarly large improvement was found by Jamison et al. (1981) in Nicaragua where radio-instruction was employed instead of traditional teaching (teachers quality is considered in section 1.3.2).

Another oft cited important resource is textbooks. Econometric analysis frequently suggests that the provision of textbooks in schools with low initial stocks boosts educational attainment dramatically (Gustafsson, 2007; van der Berg, 2008; van der Berg & Louw, 2006). In South Africa where less than 45 per cent of learners have a mathematics textbook or their own reading book this result is of particular interest. RCTs, on the other hand, have shown that the effect of textbook provision may be smaller than these studies suggest. An RCT in Kenya showed that provision of textbooks did not affect scores for the bottom 60 per cent of students but did increase test scores by 0.2 standard deviations for students who had fallen in the top percentile in the pretest (Glewwe & Jacoby, 1992). This is most likely because lower scoring students could not understand the textbooks due to language difficulties and because high levels of teacher absenteeism meant they had to use the textbooks alone much of the time – a pattern that is likely to be repeated in South Africa.

Therefore, a review of the literature shows that on the whole there are conflicting views on the importance of resources in educational attainment. The most common measure for resources, the teacher-pupil ratio, is not significant in the majority of cases in both developed and developing country studies. However, other resource measures are often statistically significant in developing countries. These include resources that aid in teaching and learning (such as textbooks, libraries and computers) and those that aid in the administration of the school (such as computers for the admin staff and telephone connectivity). In the next section the literature on the *quality* of teachers as opposed to only the *quantity* will be reviewed.

1.3.2 Teacher Quality

1.3.2.1 TEACHERS KNOWLEDGE IN SOUTH AFRICAN SCHOOLS

Because poor children are less likely to get educational support from their parents or broader community, they depend heavily on their teachers' knowledge and practices in the classroom. Although an important component of the SACMEQ project was to test teacher knowledge – a key determinant of teacher quality - South African teachers refused to participate in this part of the study in SACMEQ II. They were the only teachers of the 14 participating countries to respond in this manner, which is perhaps in itself illuminating (Taylor N., 2008). However, there are several studies which have managed to get information on teacher knowledge in South Africa – one is the Khanyisa Programme which administered a literacy and numeracy test to Grade 3 teachers in schools in the Limpopo province. The tests consisted of questions designed to assess Grade 6 learners yet the 25 teachers tested achieved an average of 67 per cent for numeracy and 55 per cent for literacy. Three teachers scored below 50 per cent in the numeracy test and 12 in the literacy test and only one teacher obtained 100 per cent for the numeracy test whilst no teacher obtained over 80 per cent in the literacy test (Taylor N., 2008).

Another study that amplifies the low knowledge of primary school teachers is the Integrated Education Programme (IEP). This project started in 2002 and was run in primary schools in four provinces in South Africa. Teachers were tested in mathematics, science and literacy in 2002 and again in 2006 after 4 years of intensive training (5 days of training a year). Worryingly, even *after* the training, no teacher who was tested in any level was able to achieve 100 per cent and the minimum scores for mathematics and science were well below 50 per cent. Additionally, the average for mathematics for the teachers who taught grades 1 to 3 was 39.7 per cent and for those who taught grades 4 to 6 it was only 32.5 per cent (Taylor N., 2008; Mabogoane and Pereira 2008). Poor teacher knowledge is not just limited to primary schools teachers. Stols et al. (2007) ran a study in 2002 where 27 Grade 10 to 12 teachers were given a matric mathematics paper before engaging in a year long distance education course after which they were tested again. It is important to note that these teachers were self-selected and therefore most likely highly motivated and probably more knowledgeable than the average teacher. However, while the education course did aid in improving marks by 13 per cent on average, the post-test average was still below 50 per cent even for these self-selected teachers (Taylor N., 2008).

These three studies, although testing only a small subset of South African teachers, show that on average teachers do not understand the material that they are expected to teach at both the primary and secondary levels. This is only logical if it is concluded that, on average, teachers undertake very little self-study from the textbooks at their disposal and demonstrate a laissez-faire attitude towards their jobs. Additionally, both the IEP and the study run by Stols et al.

show that improving teacher knowledge is a slow process even when undertaken in the intensive form that the IEP employed (Taylor N., 2008).

1.3.2.2 THE ROLE OF TEACHER QUALITY IN EDUCATIONAL ATTAINMENT

Teacher quality is often unobservable, yet in past studies have used proxy variables such as teacher salaries (on the assumption that better teachers are paid more), teacher qualifications and years of teaching experience, although it is important to note that teacher quality cannot be fully linked to any of these variables (Hanushek, 2002). In developed countries teacher education explains very little of test results – Hanushek's (1997) review of existing studies in the USA finds that this variable is only significant and positive 9 per cent of the time and in Europe teacher education was only found to be strongly significant in Switzerland where the effect of a teacher having a university degree (as opposed to just secondary schooling) on test results was 42.6 points (although having a postgraduate degree was not found to be significant) (Wöβmann, 2003). Teacher experience is also frequently insignificant in developed country research but is generally of more importance than teacher education: Hanushek (1997) finds that it has the correct sign and is statistically significant in only 29 per cent of cases however, Wöβmann (2003) finds that the logarithim of experience is significant in 9 European countries and that in the Netherlands the coefficient is as high as 10. In both the US and the European studies, the benefits of experience tend to peak at around 20 years.

In developing countries proxies for teacher quality tend to be more explanatory with experience and education being correctly signed and significant 35 per cent and 56 per cent of the time respectively (Hanushek, 1995). In South African research, teacher quality seems to be largely important – Bhorat and Oosthuizen (2008) find that housing provided by the school to teachers is positively related to the pass rate of matric students. They suspect that this variable may proxy for teacher quality as the subsidizing of living costs is likely to attract better quality teachers. Spaull's (2011) prelimary analysis of the SACMEQ III results includes a variable for teacher test score as teachers wrote the same tests as the learners. He finds teacher subject knowledge to be statistically significant, but the coefficient is very small suggesting that the impact is modest. It is important to note however, that close to 20 per cent of teachers refused to take the test which could result in sample selection bias and, additionally, similar studies have uncovered quite large effects of teacher knowledge on test scores (eg. Tan, Lane, & Coustere, 1997). Crouch and Mabogoane (2001), who use REQV (Relative Education Qualification Value) as their proxy, find teacher quality to be the *most* important resource that a school can have with an increase in teacher education of one year being associated with an extraordinary 16 point increase in pass rates. The importance of teacher qualification is also found by van der Berg and Burger (2003) but only in achievement in mathematics. The latter also investigate the effect of teacher experience and do not find it to be significant.

The evidence therefore indicates that it is highly likely that teacher quality is a crucial element in educational attainment, however it is very difficult to measure. In South Africa in particular most proxies for teacher quality are usually significant and positively related to test scores and it would seem that the quality, rather than the quantity, of teachers is important.

1.3.3 Family characteristics

Family background is widely recognized as the single most important contributor to success in school. Early work by Coleman et al. (1966) suggested that family background alone could explain much of the variation in educational outcomes for socially disadvantaged students and that schools 'don't matter':

> *Schools bring little influence to bear on a child's achievement that is independent of his [or her] background and general social context….the inequalities imposed on children by their home, neighbourhood and peer environment are carried along to become the inequalities with which they confront adult life at the end of school* (Coleman et al., 1966, p 325)

Although subsequent research has shown that much of the family influence is mediated through schools almost all studies still show that family background exerts a strong, independent effect (Rumberger, 1995). The mechanism through which this effect is transmitted is parental involvement in education which has been shown to lead to higher math scores (Sheldon & Epstein, 2010), improved reading ability (Powell-Smith, Stoner, Shinn, & Good, 2000), lower drop-out rates (Rumberger, 1995) and higher levels of educational motivation (Fan & Williams, 2010). Parental involvement is transmitted through a variety of levers; most obviously the parents' ability and interest in education and these are discussed below. The legacy of apartheid has impaired these levers in South Africa as parents are often illiterate and are unable to provide the foundations for effective literacy and mathematics, the language development or the cultural disposition for enquiry and active learning (Fleisch, 2008).

Parental ability is most easily measured by education level: In the USA and Europe the education level of parents has been found to be significant in all studies. The difference in mathematics performance in learners whose parents had a tertiary degree compared to those learners whose parents had not finished secondary school stands in the region of 40 – 50 test score points in the US and in most European countries (Wößmann, 2003). The positive effect of parent education on learner test scores could be due to direct effects, such as a parent being more able to aid the learner with homework and reading, and indirect effects such as the ability of parents to give their children better language skills. Additionally it could also capture an inherited 'ability' or 'motivational' effect in the learner (Lam, 1999). In the South African literature parent education is statistically significant. In his analysis of SACMEQ III Spaull (2011)

finds that at least one parent having a tertiary degree is highly significant in determining scores in numeracy and literacy. Other means of measuring parent education such as number of years of education for adults in the immediate area of the school (Bhorat & Oosthuizen, 2008), whether the mother has a matric (van der Berg, 2008) and the education level of the 'head of the family' (Case & Deaton, 1999) have also been shown to be statistically significant.

Further measures for parent ability include the number of books in a student's home as this can be viewed as a proxy for the educational, social and economic background of a learner's family. In Europe students with two bookcases full of books achieve much higher results than those with only half a bookcase of books. In England this effect is as large as 104 math test score points, which is slightly higher than the effect in the USA (Wöβmann, 2003). In South Africa, which is a very 'book poor' country, having more than 10 books at home has a significant and positive effect on reading, math and health test scores (Spaull, 2011; van der Berg, 2008).

There is no doubt that parents are able to positively influence their children's test results and as such children who do not live with both their parents achieve statistically lower test scores. This holds true for the United States and several European countries where the effect is as high as 19 test-score points (in Norway) (Wöβmann, 2003). In Uganda, Mozambique, Kenya and Zambia case-studies have shown that children who have been orphaned, especially those in poorer households, are less likely to attend school and, when they do attend, they are at a distinct disadvantage in both primary- and high-school (Arndt, Nhate, & Barslund, 2005; Case, Paxson, & Ableidinger, 2004; Nampanya-Serpell, 2000; Deininger, Garcia, & Subbarao, 2003). In South Africa this is a particularly crucial point as the national HIV/Aids epidemic has left many children without one or both parents. Van der Berg (2008) finds evidence that learners who live with their parents are statistically likely to do better while Spaull (2011) finds evidence that being an orphan has a statistically negative effect on learner reading scores. Interestingly, he also finds that the effect of living in a children's home (orphanage) is statistically significant and extremely large for all tested subject areas.

Aside from parent-related variables there are several student characteristics that are significant, these include age (which is negatively related to test scores as it captures the effect of repeaters) as well as language. Language in South Africa is a pertinent issue for black learners as they are taught in their home language until the end of Grade 3 after which they are taught and tested in English. Therefore it is not surprising that recent studies have shown Grade 6 leaners (tested by SACMEQ) who speak English 'sometimes' or 'always' have statistically higher results than those who do not speak English at home (van der Berg, 2008, 2002; Spaull, 2011).

Student health has come to be seen as an important input into education in recent years and RCTs in particular have focused on the effect of school meals (Vermeersch & Kremer, 2004), clinic visits and deworming (Miguel & Kremer,

2004). These studies find that the latter both improve attendance and that school feeding programs increase test scores slightly. School feeding programs exist in many poor South African schools (the Penninsula School Feeding Programme alone feeds 748 schools in just the Western Cape) and learners that have fewer than 3 meals a day have statistically significant lower scores in reading (Spaull, 2011).

Therefore there are a number of 'family-background' variables which play out through parent involvement in learning and general learner characteristics. The context that these provide was deemed by Coleman's work to be the most powerful predictor of student achievement and more recent studies also indicate that family background is statistically significant in both developing country and developed country settings. This result is largely consistent across the majority of RCTs and EPF research and the importance of this subset of variables has been captured in the South African literature.

1.3.4 School Management

1.3.4.1 The state of school management in South Africa

Previous sections have shown that resources and teacher quality are important determinants of school results but will only be effective if they are put to use in an efficient manner. Van der Berg (2008) argues that the high variability in test results in poor schools even after controlling for SES and teacher inputs points towards varying efficiency which hints at managerial problems. Over the last decade there has been much debate over the role of school leaders in improving performance and there are two major schools of thought on the topic. The first sees the principal as a charismatic leader who exercises authority in a hierarchical manner and the second calls for distributed leadership where leadership functions are shared by school managers and teachers as well as parents and sometimes students thus increasing commitment towards a common goal (Taylor N, 2008; Louis, Dretzke, & Wahlstrom, 2010).

South Africa has experienced 'seismic shifts' (Hoadley, Christie, Jacklin, & Ward, 2009) in the management landscape and there has been a move toward the decentralization of leadership which has played out formerly in the Department of Education's requirement that schools have a School Governing Board (with majority parent members) and increased focus on the role of the Senior Management Team (SMT) (van der Mescht & Tyala, 2008). Decentralization of leadership has been a key feature of institutional reform throughout the world and the main argument that underpins it is that people who are influenced by the 'rules of the game' (North, 1990) are empowered to participate in the decision-making process thus alleviating informational asymmetry (King & Ozler, 2005). King and Ozler in their analysis of Nicaraguan schooling decentralization find that *de jure* decentralization does not

actually have any effect on test scores, but *de facto* decentralization is associated with significant and large increases in math scores. It is therefore important to note that even though all schools in South Africa are required to exercise decentralized or shared management, this does not necessarily mean that schools practice a decentralized form of management. There are several reasons why this may happen in the South African context as discussed below.

1.3.4.1.1 HINDRANCES TO DECENTRALIZATION

In South Africa there are several issues with school management. An extremely worrying feature in poorer schools according to Taylor (2008) and others (Thurlow, 2003; Grant, 2006; Christie, 1998) is the general failure of staff to take responsibility or exercise control over their school and the fact that the majority of schools are characterized by a culture of opposition, dependency and non-participation as a legacy of apartheid (Thurlow, 2003). There is a sense of apathy among school leaders and this is taken advantage of by other actors in the school. The most obvious example of this is the high levels of teacher absenteeism which go unpunished by management who tend to blame transport systems or illness rather than the inherited dependency culture (Taylor N., 2008). This is in line with Elmore's (2004) research which notes that a culture of passivity and failure is present in schools where managers and teachers assign causality for success or failure to forces beyond their control. This pattern is also found in other African schooling systems, and Glewwe et al. (2004) are able to give anecdotal evidence from Kenya where they found that teachers were absent 20 per cent of the time, largely blaming the transport system. However, workers in a non-profit organisation in the same area (who relied on the same transport system) were only absent 6,3 per cent of the time. As it stands 97-100 per cent of schools in the lower 4 quintiles in South Africa reported absenteeism and late coming of teachers as a problem which is much higher than the SACMEQ mean. The National School Effectiveness Study (NSES[1]) found that between 10 and 20 per cent of teachers in the 266 schools surveyed were absent on the day of the survey (Taylor S., 2011) and SACMEQ III uncovered self-reported teacher absenteeism of approximately 20 days a year (Spaull, 2012). Although neither of these measures is entirely accurate, they do manage to demonstrate that teacher absenteeism is unacceptable high and largely unpunished in South Africa.

Additionally the PPP[2] in 2003 revealed that more than a quarter of schools start late and that in close to half of the schools teachers and learners do not return promptly after breaks (Taylor N. , 2008). Further, even when teachers are present it does not mean they are adding value to learning by students and Chrisholm et al. (2005) who observed 10 schools over a range of former departments found that even when teachers are present they only spend approximately 41 per cent of their time (or 3.4 hours a day) teaching. Howie et al. (2008) uncovered that the way the timetable is

[1] The NSES surveyed schools between 2007 and 2009

[2] The Pupil Progress Project (PPP) was undertaken in a random, stratified sample of 90 schools in the Western Cape

structured in many South African schools does not maximize teaching time. For example over 70 per cent of South African schools spend less than 3 hours a week reading whereas internationally only 44 per cent of schools spend so little time on reading. The high levels of teacher absence have been shown to influence test scores negatively: van der Berg and Louw (2006) find that the negative effect of teacher absenteeism on mathematics test scores in South Africa is large and highly significant whereas Christie et al. (2007) who study a small subset of poor but effective South African schools find that, without exception, time is a highly valued commodity in these schools and teacher absenteeism is not reported to be a problem in any of these schools. Additionally, in an RCT in India where teachers had to take a photograph of themselves and their class every day for a financial reward, the resulting decrease in teacher absenteeism increased test scores by 0.17 standard deviations (Duflo & Hanna, 2005).

Secondly, even when management has the motivation to embark on a system of distributed leadership there may be problems with *implementation*. One such problem lies on the SGBs of poor schools where low levels of parent literacy and role confusion can lead to poor functionality:

> *"For many schools in South Africa, especially the previously black schools, the involvement of parents at governance level is new. The limited training of the main role-players in the management and governance of schools, coupled with their uncertainty regarding their functions and duties, makes it sometimes difficult for principals and parental SGB members to work together harmoniously,"* (Heystek, 2004, pp. 308-309)

Educator members of the SGB and the principal often take advantage of the low levels of parent literacy and 'make policies to suit teachers' rather than policies that benefit the school as a whole (Xaba, 2011). In other cases there is open conflict between SGB parent members and educator members (Joubert, 2006) Additionally it has been found that SGB members often overstep their roles, especially with regards to financial matters, and force deviations from the budget (Xaba, 2011).

The relationship between the principal and other management groups are often fraught with complications as principals are unwilling to share their power with the SMT leading to a 'political' power struggle within the school (van der Mescht & Tyala, 2008). Further, Mkentane (2003) argues that principals often do not follow the rules on the SGB as they wish to maintain central control. Jansen (2000) argues that there has been an 'overload' of policy reform with regards to school management which has resulted in a loss of clarity as to the schools objectives and management's role. Clearly there are major obstacles to effective management systems in South African schools, some of which are related to a capacity shortage. However, a major concern is the willingness of parties to override

with impunity the formal and informal rules of the game associated with the collaborative effort. This plays out through in a variety of ways namely: shirking or free riding as seen with high levels of absenteeism; distribution conflict as seen through the frequent unwillingness of principals to share power and corruption as seen through the use of the school budget for ulterior purposes. However, there is another more disturbing form that this can take and that is 'predation' which means that actions are undertaken that use channels of political support *external* to the specific arena of cooperation to override the rules (an example would be the inability to sanction teacher absenteeism due to high levels of teacher union interference) (Levy, 2011).

There is evidence that governance of South African schools is problematic, however, although it is universally regarded as a key element of good schooling, qualitative studies give mixed results as to the impact of leadership on test scores and this is discussed below.

1.3.4.2 THE ROLE OF MANAGEMENT IN STUDENT ACHIEVEMENT

It would appear that in South Africa the ability of a school to convert resource inputs into educational outputs depends on the leadership abilities within the school and the relationship between leadership and test results has been shown many times in qualitative studies (eg. Reitzug & Patterson, 1998; Christie, Butler & Potterton, 2007). However, Leithwood and Wahlstrom (2008) note that quantitative efforts to establish links between leadership and learning are relatively rare and tend to give inconclusive and weak results (Khattri, Ling, & Jha, 2010; Hallinger & Heck, 1996; Witziers, Bosker & Krüger, 2003; Louis, Dretzke & Wahlstrom, 2010; Ross & Grey, 2006).

One possible explaination for why there has been such difficulting in establishing the significance of leadership is that different schools may have different needs and therefore may be characteristed by their developmental stage, for example Marzano and McNulty (2005) state that leadership should be different depending on the developmental stage of the school and that it can be engaged in first-order change or second-order (innovative) change, while Day et al. (2009) distinguish three broad phases of leadership success: early (foundational), middle (developmental) and later (enrichment). A second explaination for the lack of statistically significant evidence is that educational researchers hold very different views regarding the ways that school leadership can improve educational outcomes (Witziers, Bosker, & Krüger, 2003). This has resulted in multiple models of leadership (Bush (2007) describes 9 such models existing in the current literature) resulting in segmented and non-comparable growth in information. Witziers et al. (2003) argue that the lack of an integrated theory of school leadership is prohibiting useful research and call for a re-conceptualization of the phemonenom of educational leadership.

Rather than re-conceptualizing school leadership, this paper recommends the use of an existing literature, namely Elinor Ostrom's (1990, 1994, 2005, 2009) Institutional Analysis and Development (IAD) framework for assessing the strength of governance in the school setting. This framework is used in part to overcome the disjointed views on leadership, however, it is also particularly useful in analyzing a system where the vast majority of schools are dysfunctional. The framework has been used successfully and repeatedly in analyzing the strength of a broad variety of institutions from common pool resources like forests and irrigation, to local government, day care facilities, and micro credit providers (Polski & Ostrom, 1999). The IAD framework will be discussed in the following section.

1.4 Literature Summary

Education has gained increasing international focus in the preceding decades. However a review of the current literature has shown that South African schools are largely dysfunctional. They fall far below the international benchmark in all tested learning areas (including mathematics, reading and science) and at every testing level. Further, within the South African system there is a clearly bimodal pattern in school results and only the richest, formerly advantaged, schools are able to achieve good results. While there is an undeniable problem with the functionality of schools in the lower quintiles, it does not seem to be driven by insufficient funding. What is more likely is that the extensive funds supplied by government have been spent in a manner which does not maximize the learning opportuinities of students. A review of the current literature has shown that there are some resources that are more likely to increase test scores than others. However, it has also shown that to a large extent the effect of resources (especially class size) on test scores is inconclusive. Other inputs, such as the quality of teachers employed and the characteristics of the learners' families have less mixed but still not universally significant effects.

Much of the South African literature indicates that the root cause of the poor quality of education offered in the country is largely passive management and the inherited 'dependency' culture of poorer schools. However, the literature on management as a determinant of school results also gives mixed evidence largely because of the problems that arise with 'measuring' management. This paper hopes to overcome this complication by proposing a new method of benchmarking school leadership. Chapter 2 introduces the IAD framework and clarifies how it can be used to benchmark governance within schools through the development of several 'governance indices'. In Chapter 3 the data set used in this dissertation is discussed. Following this a number of indices are created for the schools within the set. These include the governance indices as well as a variety of control indices derived from the literature. Finally, a range of statistical methods are employed in order to determine the relative strength of the relationship between school governance and test results in South African schools. Chapter 4 elicidates the conclusions of the dissertation.

CHAPTER 2 Modeling School Management: A Proposed Approach

2.1 The Institutional Analysis and Design Framework

In order to build any kind of model which tests the effect of school management on learner test results it is first necessary that there is some meaningful way of benchmarking school management or governance. This paper uses the Institutional Analysis and Development (IAD) framework developed by Nobel Laureate Elinor Ostrom and her colleagues (1990; 1994; 2005; 2010). While the IAD framework was originally designed primarily through studies of common pool resources (CPR), this dissertation argues that the school system is an institution which requires similar governance structures to more traditional CPRs. The main reason for this is that both face collective action problems and, as discussed in the previous analysis of the literature, it appears that many actors in schools, particularly teachers and management, choose to override with impunity the formal and informal rules of the game associated with collaborative effort. This plays out through absenteeism, poor time management, disproportionate strike action and the ensuing lack of disciplinary action taken by those in management positions amongst other things.

Section 2.1.1 explains the fundamentals of the IAD framework, showing how the school is able to fit into the primary design. Following this, one aspect of the framework, known as the 'best practice principles,' is reviewed as it is from these that the main hypothesis of this paper is derived.

2.1.1 The School as an Action Arena with multiple Action Situations: An Introduction To The IAD Framework

Elinor Ostrom's Institutional Analysis and Development framework is designed around the premise that in order to "[understand] a complex whole requires knowledge about specific variables and how their component parts are related" (Ostrom, 2009, p. 419). By stripping an institution down to its individual components the framework is able to systematically link the social goal being pursued, individual decisions as to whether to cooperate, the quality of collective action, and the results achieved. The IAD framework has several conceptual units of analysis (as depicted in Figure 4) the most significant unit for policy design being the '*action arena'*. The action arena includes actors interacting in a social space called the *action situation* and these interactions produce the outcomes of the institutional

arrangement (Ostrom, 2005, p. 14). The outcomes are also affected by contextual factors which encompass the social, cultural, institutional and physical environments.

If the school is viewed as an action arena it becomes clear that there are multiple managerial action situations of importance. Schools may have different kinds of leadership groups but those that are typically important in South African school systems are: the school governing board (SGB), the senior management team (SMT) and phase teams (primary schools are divided into foundation (Grade R to 3), intermediate (Grade 4- 6) and senior (Grade 7-9) phases) or grade teams. The action situations are comprised of actors, for example, the SMT is often made up of the principal, the deputies and the heads of department (HODs). These actors have to interact, for example in the school situation a new teacher may have to be hired and the members of the SGB will have interact by interviewing, discussing and recommending a candidate for hire. The main goal or outcome of a school is typically to generate good academic results and this outcome is affected by the interactions within the action situation. However, the outcome can also be affected by contextual factors. While biophysical conditions are not as important a factor in the school arena as they would be in a more traditional CPR (such as a fishery) they can still influence school results particularly in rural areas (for example children or teachers who walk to school are less likely to arrive at school if it is raining). The attributes of the community (as well as the family), such as education and employment levels, have been shown in the literature to be particularly influential on learner test results. Finally, the rules in use also influence results. These correspond to clusters of elements in the action situation and will be discussed later.

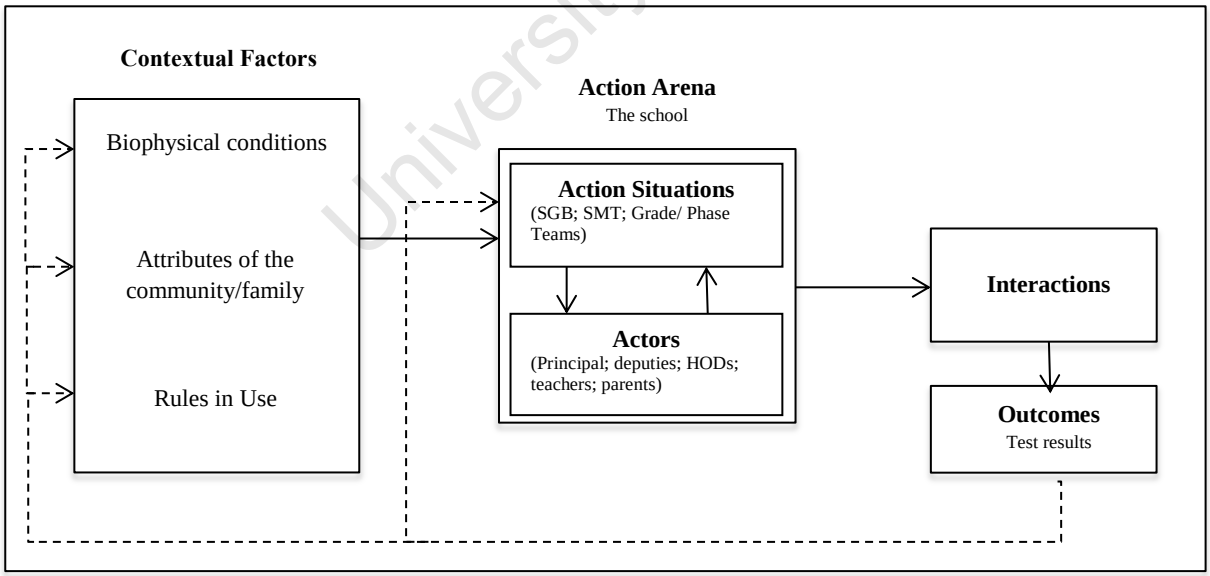


Figure 4: The IAD Framework

Source: Adapted from Ostrom, Gardner and Walker (1994, p. 37)

Figure 5 below introduces a more in depth look at an action situation. *Working Components* of an action situation

specify the nature of the relevant actors as well as the resources and options they face, and thereby serve as a generalization of the "rules of a game" (Ostrom, Gardner, & Walker, 1994, p. 29). These components include: actors in positions who must decide, in line with rational choice theory, among diverse actions in light of the information they possess about how the actions are linked to potential outcomes and the costs and benefits assigned to the actions and the outcomes. The amount of information that the actors have as well as the control they have over the potential outcomes are also influenced by the external variables shown in the previous diagram. One set of these external variables are the 'rules in use' and this is expanded upon in Figure 6.

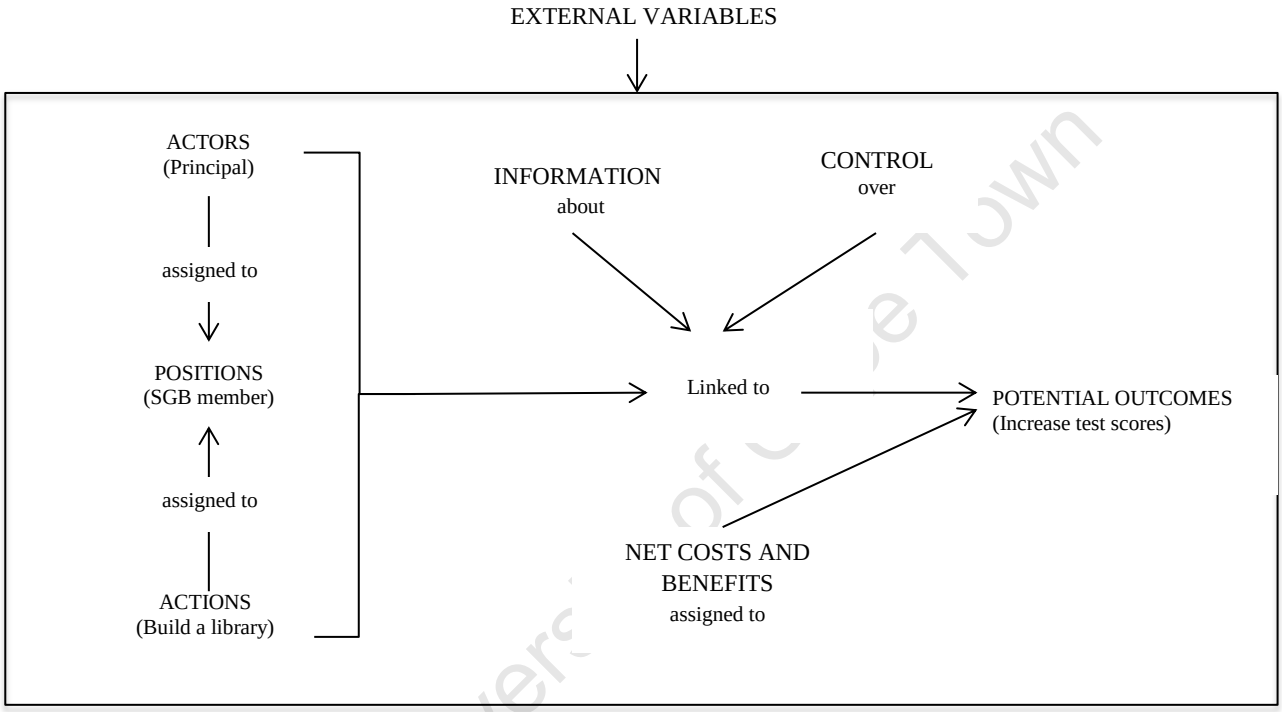


Figure 5: The Working Components of an Action Situation

Source: Ostrom (2005, p. 33)

To clarify the action situation consider the following example illustrated in parenthesis in Figure 5. One of the actors in a school is the principal. The principal may have many roles: he is a member of the SMT, he may also be a teacher and he must be a member of the SGB. A particular task (or action) of the members of the SGB (including the principal) is the preparation of the budget. If a budgetary decision is being made about whether or not to build a library the SGB will have to weigh up the net costs and benefits of such a decision in relation to the potential outcomes. There are a number of costs: first there is a clear monetary cost, as well as an opportunity cost, further there may be future costs (such as maintenance, purchasing books or the hiring of a librarian) involved. However, the library may also be able to increase the test score outcome by providing a place to study after school, improving learner and staff literacy levels through reading or by attracting higher quality pupils in the future. These costs and

benefits must be weighed. Additionally, the information about, and control over the decision may be influenced by external factors. For example, the school may have been given a grant that *must* go towards the building of a library or there may be some rules in use that influence the decision. Rules in use are a component of the IAD framework that is external to the action situation but influences and shapes the outcomes. These rules may be formally written in law or may simply be norms that are generally adhered to. The rules correspond to the working components of the action situation as shown in Figure 6 below.

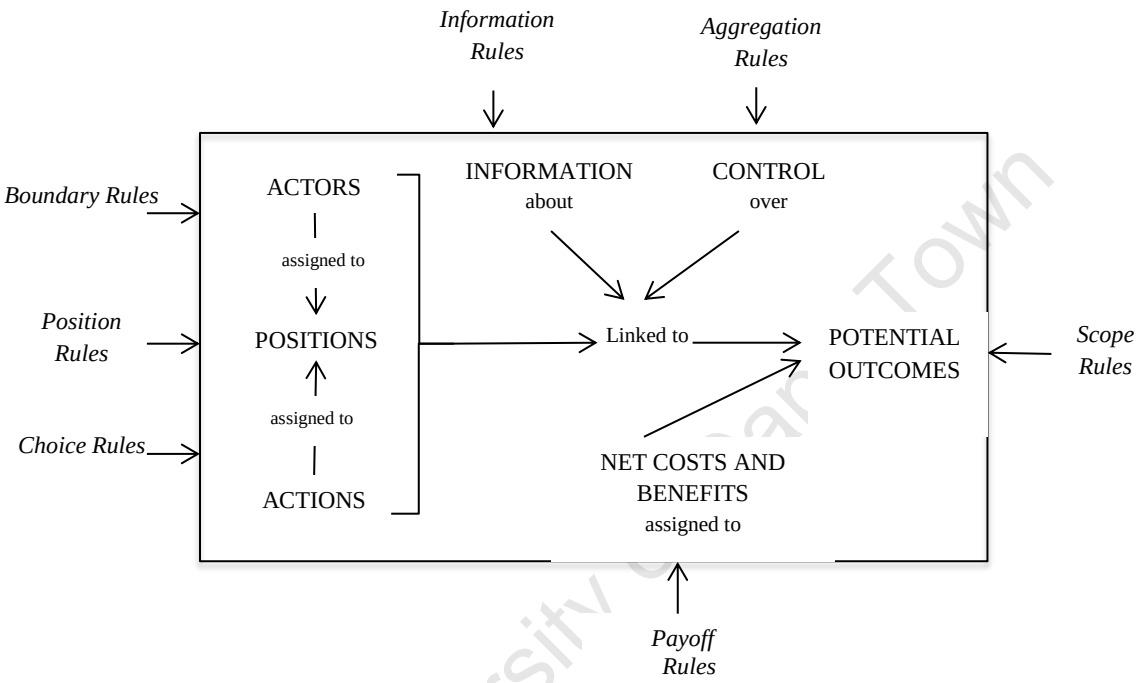


Figure 6: Rules in Use

Source: Ostrom (2005, p. 33)

The rules in use as they would appear in the school context are summarized in Table 2 below with examples given specific to the SGB action situation.

Table 2: The Rules in Use within a School

Rule…	Specifies…	Example
Position rules	A set of positions and how many participants are to hold each position	The SASA (1996) states that there must parent members on the SGB and the number must be one more than the educator members.
Boundary rules	How participants enter or leave these positions	In order to become an educator member of a SGB one must first be nominated by the staff and then voted in.
Choice (Authority) rules	Which set of actions is assigned to which position at each node of the decision tree.	The principal cannot hire any staff member directly as this action is assigned to the SGB and not assigned to the principal's role. But the principal may be involved in the hiring process as an ex-officio member of the SGB.
Aggregation rules	The transformation function from actions to intermediate or final outcomes	Decision making on the SGB is done through discussion and finally voting where all members' votes count equally.
Scope rules	A set of outcomes that may be affected.	The SGB is not involved in decisions that affect the school curriculum as this is beyond the scope of their duties.
Information rules	The information available to each position.	If a discussion is taking place on the SGB that is of a sensitive nature, (for example a discussion on teacher performance) learner members may be required to not take part in the meeting as this information is not available to their position.
Payoff rules	How benefits and costs are required, permitted, or forbidden to players based on the full set of actions taken and outcomes reached.	SGB members are forbidden to receive monetary compensation (a benefit) for their role but they are required to attend meetings (a cost)

Source: Adapted from Ostrom, Gardner, & Walker (1994, pp. 41-42)

If the school is seen as an action arena it is clear that each 'action situation' is subject to different forms of these rules. For instance the Department of Education has created, through the 1996 South African Schools Act, a very specific position rule for the SGB stating that the members must include: parents, educators, non-educator staff members and learners in the 8th Grade or higher and that there must at least one more parent member than staff members, [3] but this same rule does not apply to the SMT.

This discussion has made it clear that the IAD framework is an appropriate means to structure analysis of the school setting. In this paper the 'best practice principles' which are drawn from the rules in use are used as a means to measure management in the school and these are discussed in the following section.

2.1.2 The Best Practice Principles

At the core of Ostrom's work are the '*Design Principles* for sustainable management of common pool resources' also known as 'best practice principles' (Ostrom, 1990). These principles were distilled from theory and decades of empirical studies of community-based CPR situations such as fisheries, forests and grazing land. They capture best practices of CPRs that have been used sustainably for decades or even centuries, thus avoiding the famous "tragedy of the commons" without relying on privatization or a "Leviathan" authority. There are eight best practice principles and, although not all the principles need to be realized for an institution to be successful, the prospects for sustainable governance tend to increase when more of these principles are in place (McGinnis, 2011) Ostrom found that **"**robust systems for governing common pool resources had met most of the good practice principles, and that those systems that had collapsed or were performing ineffectively were not so structured" (Ostrom, 2005, p. 259)**.** The best practice principles have been used many times and in their analysis of 91 prior studies that evaluated the principles empirically Cox et al. (2010) find that the 'principles are well supported empirically' (p. 38) when used to assess a diverse group of institutions.

There are eight of the principles and they correlate to the rules discussed above. The best practice principles are presented in Table 3 in a slightly adapted form that makes them useful for assessing schools.

[3] South African Schools Act 1996 Section 23, 2a-2d

Table 3: The Best Practice Principles

The Rules	Best Practice Principles
Rules governing eligibility	
Boundary rules Position rules	*1. Clearly defined participant boundaries* It is clear who is allowed to be on the SGB/SMT and so on and the roles of these managerial bodies are clear and understood by participants and non-participants alike.
Rules governing benefits, costs and decision-making	
Payoff rules	*2. Congruence* Rules specifying the amount that a participant benefits are proportional to the time that the participant gives up to fulfill the role. Actors should be satisfied that they are compensated for the role they are required to play.
Aggregation rules	*3. Collective-Choice Arrangements* Most individuals affected by the operational rules within the school are authorized to participate in making and modifying them. This means that the SGB (which includes staff, learners, management and parents) needs to function effectively and that there all members of the school frequently discuss school results and policies.
Choice rules	4. *Conflict-Resolution Mechanisms* Rapid, easy-to-use, mechanisms exist for resolving disputes among participants within and between actions situations. 5. *Graduated Sanctions* Sanctions for rule violations (such as absenteeism) are applied and these sanctions start very low but increase in intensity if a participant repeatedly violates a rule. Additionally, sanctions are differentiated across violation type.
Rules governing monitoring	
Information rules	6. *Monitoring*: There is active monitoring of participants and those who monitor the actions of participants are accountable to the participants and/or are the participants themselves. This means that those who monitor an action situation must be involved in that same action situation as a participant.
Rules governing delegation of decision authority	
Scope rules	7. *Minimal Recognition of Rights*: The rights of participants to self-organize and set rules (or participate in rulemaking) are recognized by the South African government. *8. Nested Initiatives* There is a polycentric system with multiple nested layers of governance including at least a principal, an SMT and an SGB

Source: Adapted from Ostrom, 1990

2.2 Applying the IAD Framework to Schools

2.2.1 Hypothesis and Caveats Using the Ostrom Principles

The major hypothesis of this paper comes straight from Ostrom's observation that the stronger the presence of the best practice principles, the more likely it is that an institution will experience sustained success. In school situation the hypothesis reads that *those schools which are able to produce good academic results in adverse situations have management systems that subscribe more closely to the best practice principles as outlined by Ostrom than those schools in similar situations which produce poor results.*

However, with this hypothesis in mind it is important to note that the IAD framework has not been constructed with reference to the political context. In the review of the literature it was shown that actors in a school often override the rules and that this could occur through 'predation' or the use of political channels external to the action situation. While the Ostrom principles can prevent free riding, corruption and distribution conflicts, they can only do so much to deter predation (such as teachers using unions or 'contacts' in the Department of Education to legitimize absenteeism). Ostrom's work has shown that without the best practice principles in place an institution cannot be successful. However, the political context may hinder a schools success even if the principles are in place. Below the relationship between the political environment and the Ostrom principles is depicted graphically. Although the major hypothesis holds true, it is important to note that there may be schools which subscribe strongly to the principles but remain unsuccessful because of high levels of predation. In this case, where there is both predation and subscription to the Ostrom principles, the outcome is 'uncertain', however Levy (2011) argues that this outcome will be 'success' if the school management has its own 'trumping networks' that can overcome the threat of predation. A trumping network exists if predation can be overcome by influences outside of the action arena. Therefore if a staff member predates by being constantly absent but cannot be dismissed due to his or her relationship with a member of the Department of Education, only a principal who has equally strong ties to similarly powerful figure outside of the school can trump this threat. However, this discussion is beyond the scope of this paper.

Table 4: Extension of the Hypothesis

		Is there an environment of predation?	
		Yes	No
Are the Best Practice Principles in place?	Yes	Uncertainty	**Success**
	No	Failure	Failure

2.2.2 Index creation

In order to assess the strength of school management this paper proposes that the best practice principles are used as a benchmarking system. In order to do this indices must be created for each principle and averaged in order to create an overall 'management index'. First, however, it is important to note that some indices are not of any use for analysis of schools which are embedded in the same context. For example, the *minimal recognition of* right principle states that the government must recognize the right of participants to self-organize and this applies linearly to all schools if they are taken from the same region and therefore will not be measured. The *nested initiatives* principle also applies to all public schools in South Africa as it is required by law that all schools have a SGB and an SMT. Furthermore, as is the case in projects such as this one, the data dictates the construction of the indices and it is likely that not all the indices will be able to be created perfectly or at all. However, bearing in mind that the best practice principles work independently of one another the inability to create an index will not influence results. The construction of the various indices is discussed in depth in Chapter 3.

CHAPTER 3 Descriptive Statistics

3.1 DATA: WCED TESTS AND THE SPADE PROJECT

The majority of the data in this paper comes from the SPADE (Schools Performing Above Demographic Expectations) project run by the School of Education at the University of Cape Town. The SPADE project started in 2011 and in is still in process. The project poses the question *'what factors can be identified in schools performing above expectations given their socio-economic contexts that may contribute to better performance relative to low performing schools in similar socio-economic contexts?*. The project has acquired a variety of highly detailed data in poorer schools through a series of questionnaires, observations and interviews. The schools were selected on the basis of their Grade 3 classes' performances in the Western Cape Education Department (WCED) systemic tests, also called the 'litnum' tests (as they test literacy and numeracy skills).

The WCED tests are written only in primary schools in the Western Cape as an additional testing mechanism to the Annual National Assessments (ANAs), which are written nationwide. The WCED assessments were introduced in 2002 at the Grade 3 level and 2003 at the Grade 6 level and were conducted on a biennial basis until 2009 where after they have been written annually. In 2011 Grade 9 tests were also introduced and all three grades were tested. The literacy and numeracy papers have been designed to provide a diagnostic assessment of the provincial education system in order to inform future literacy and numeracy strategy, and while teachers do not see the tests (they are invigilated by members of the Joint Education Board (JET)), they are given a descriptive analysis of the results so that they know where their weaknesses lie (WCED, 2011). What the tests have primarily shown is that the majority of learners do not have the required literacy or numeracy skills for their level of education. Table 5 below shows the pass rate for Grade 3 learners in the first four systemic tests (a pass for the WCED tests is 50 per cent). Although the literacy pass rate has steadily increased, only just over half of Grade 3 learners were able to pass the literacy test in 2008. The numeracy test pass rate has actually decreased and in 2008 just over a third of learners were passing. Many of the questions (especially in the literacy paper) are multiple-choice.

Table 5: Literacy and numeracy pass rates, 2002 - 2008

Grade 3	2002	2004	2006	2008
Literacy	35.7%	39.5%	47.7%	53.5%
Numeracy	37.1%	37.3%	31%	35%

Source (WCED, 2009)

3.1.1 Descriptive Overview of the Data

The SPADE project used the results of the WCED literacy and numeracy tests for Grade 3 from 2002 to 2008 (the results of four test cycles) to select schools for the sample. This project aims to explore the relationship between inputs and educational attainment in poor schools and for this reason schools in the upper two quintiles were not considered in the sample selection (this excluded all former white schools). Further, schools with less than 200 learners where also excluded as a variety of studies have shown that small schools (such as farm schools) are subject to different forces. Additionally all schools which included grades beyond Grade 7 (comprehensive and intermediate schools) were excluded as these schools employ specialized (subject specific) teachers. In the bottom three quintiles schools that had achieved an overall mean for the four-stage period that was at least 5 per cent above the overall mean for their former department[4] were selected. This resulted in a total selection of nine schools – five former HOR[5] schools and four former DET[6] schools. As such the nine schools represent the *full population* of large primary schools in the lower 3 quintiles achieving above their former-department means in the WCED tests.

Following the initial selection five more schools were selected which *matched* the demographic profile of the nine high achieving schools but whose averages over the same period were a full 5 per cent below the mean of their former departments. Three of these schools were former HOR and the other two were former DET schools. This was an imperative selection mechanism given that this paper intends to test the hypothesis that schools in *similar situations* perform differently based on the functionality of their governance systems. Therefore the selection resulted in a demographically similar 'control group'. The final selection of the schools resulted in five 'performance bands': two 'high' performance bands and a corresponding 'low' performance band for HOR schools and one 'high' and one 'low' performance band for DET schools. Table 6 below shows the features of the performance bands.

[4] The overall mean performance per former department on the WCED math and literacy tests over four cycles are as follows: HOR: 49.9%; DET: 43.1%

[5] Former House of Representatives (formerly 'coloured schools')

[6] Former Department of Education and Training (formerly 'black schools')

Table 6: School Performance Bands

Band Number	Mean Score	Former Department	Number of schools in band	Rank
1	Above 60%	HOR	2	High
2	55% – 60%	HOR	3	High
3	50% – 55%	DET	4	High
4	45% - 50%	HOR	3	Low
5	35% - 40%	DET	2	Low

The following table gives a basic overview, including the average test scores, of the schools in terms of the sets of high performing school(s) and the demographically similar low performing school. High performing schools are given number pseudonyms whereas low performing schools are named with letters.

Table 7: Overview of the Selected Schools

Matching Set Number	Former Department	Pseudonym	Quintile	Average Test Score	Performance Band
Matching set 1	HOR	School 1	3	62.2	1
		School A	3	45.6	4
Matching set 2	HOR	School 4	3	61.1	1
		School 5	3	55.1	2
		School C	2	48.4	4
Matching set 3	HOR	School 6	2	56.5	2
		School 7	3	56.3	2
		School D	2	49.1	4
Matching set 4	DET	School 3	2	52.5	3
		School 2	2	51.1	3
		School B	3	37.2	5
Matching set 5	DET	School 8	2	53.3	3

Matching Set Number	Former Department	Pseudonym	Quintile	Average Test Score	Performance Band
		School 9	1	52.5	3
		School E	1	39.3	5

3.1.2 Data Limitations

Unfortunately the nature of the SPADE project and the process of school selection described above have resulted in a very limited sample size. With only 14 schools in the data set it is clear that any statistical findings cannot be extrapolated to represent the entire population. Further, the size of the sample also poses problems for econometric analysis. However, it is also important to note that despite these limitations, the SPADE project was able to acquire highly detailed data on family and community characteristics as well as on school resources. Most importantly, the data relating to school management is extremely textured which allows for a degree of analysis which has been unusual in previous South African data sets. Therefore, despite the limited sample size, the data may still be able to uncover nuanced relationships between school governance and test results. In the following section the data for both the school level and non-school level variables is discussed and the correlation between these variables and test results of each school are examined. It is also important to be aware that while the correlation coefficients give an indication of the magnitude and direction of the relationship between the variables, they do not identify any underlying *causal relationship.*

3.2 SCHOOL-LEVEL VARIABLES

The school level data was obtained primarily through discussions with principals and staff members as well as through observation of the 14 schools.

3.2.1 Resources

Table 8 below gives an overview of the schools' non-learning and learning resources (including teacher quality) by achievement band. There is a remarkable similarity between the resources and the following non-learning resources have been excluded from the table as they were present in all schools: a staffroom, an office for the principal, an office for admin staff, a computer for the principal, a computer for the admin staff, internet, running water and electricity. There were also a number of learning resources that were present in all schools namely: enough desks and chairs for all the learners, a functioning computer laboratory and well-maintained classrooms and these are also

excluded from Table 8. The final column of Table 8 presents the mean difference between the high achieving bands (1, 2 and 3) and the low achieving bands (4 and 5) and indicates whether this difference is significant.

The only physical learning resource that differs between schools is the presence of a school library. Looking at the data it is clear that top performing schools are more likely to have a library than their below average preforming counterparts and all but one top performing school has a library but only one low performing school does. In many schools there may be a library present but without a designated teacher to open and monitor the use of the space (a 'librarian') the resource may be under-utilized. Six out of the nine top performing schools have both a library and a librarian and, markedly, none of the five below average schools do. Class size, which was recurrent in the literature, seems to be very similar across the sample with the performance bands' averages lying between 32 and 37 pupils. It does seem as if higher performing schools may have slightly smaller classes, especially in the HOR categories where the two higher performing bands have an average of between 32 and 33 learners but the low performing band has an average of over 37 learners per class. The mean difference in class size between high and low achieving schools is statistically significant at the 10 per cent level.

Teacher quality is not directly observable and in this paper teacher education level and teaching experience is used as a proxy. The schools each had between two and five Grade 3 teachers and as such the total years of teaching experience for Grade 3 teachers was averaged for each school. Qualifications were rated according to the teachers Relative Education Qualification Value (REQV) and the number of teachers with a REQV of 13 or lower (without an appropriate degree or 'under-qualified' by South African standards) were averaged for each school and then again for each band. Former-HOR school teachers in the sample tend to be more experienced, with all bands having an average teaching experience of more than 20 years. All schools had at least one teacher with an REQV less than 14, however, former-DET schools, on average, had less under-qualified teachers. Teachers in the high performing schools in this sample do not necessarily have more years of education or teaching experience.

Table 8: Mean School Resources by Performance Band

School Resources	School Performance Band					n=14
	1	2	3	4	5	Mean Diff. (high – low)
LEARNING RESOURCES						
Library	1.00 (0.00)	0.67 (0.58)	1.00 (0.00)	0.33 (0.58)	0.00 (0.00)	0.725**
Library with librarian	0.50 (0.71)	0.67 (0.58)	0.75 (0.50)	0.00 (0.00)	0.00 (0.00)	0.64***
Class size	32.75 (3.18)	32.89 (5.48)	34.40 (2.05)	37.06 (5.18)	34.83 (3.06)	-2.60*
School size	1291.00 (43.84)	755.67 (160.53)	1155.25 (188.84)	821.67 (274.98)	883.50 (167.58)	214.72
Learning Resource Index (R_L)	**6.67**	**8.81**	**7.18**	**3.03**	**3.19**	
TEACHER QUALITY						
Average experience (years)	25.83 (3.06)	22.00 (3.12)	13.28 (4.77)	24.88 (3.08)	18.17 (2.59)	-1.16
Average with REQV less than 14	1.5 (0.71)	1.67 (1.61)	1.25 (0.50)	1.33 (0.58)	1 (0.00)	0.308
Teacher Quality Index (R_T)	**6.27**	**3,47**	**3,13**	**7,16**	**6,95**	
Resource Index (R)	**6.47**	**6.14**	**5.16**	**5.09**	**5.07**	
Department Averages	**6.30**	**5.16**		**5.09**	**5.07**	
Overall Performance Average		**5.73**		**5.08**		

Standard deviations in parenthesis
* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

For ease of comparison all mean resource scores in Table 8 were indexed to lie between 0 and 10[7]. The averages of these normalized variables are given in order to create a learning resources index (R_L), a teaching quality index (R_T) and an overall resources index (R). The high performance bands achieve an average overall resource index score of 5.73 while the low performance bands' score is only incrementally lower at 5.08. The Spearman correlation coefficients are between the R_L, R_T and R scores and test scores for each band and then for each school are given in Table 9. The learning resource index is quite highly correlated to test results and stands at over 0.6484 (significant at the 5 per cent level) when determined using individual school results. Teaching resources are *negatively* correlated to test results when determined by band and only show a small positive correlation when determined by school. However, neither of these results is significant, even at the 10 per cent level. The overall resource index is not significantly correlated to school results by band. However, the coefficient between test results by school and the

[7] When the variable has previously been shown to be positively associated with results (like more years of teaching experience) the formula $10 * (x - S_{min})/(S_{max} - S_{min})$ was used where S represents the set of band averages. When the variable was negatively associated with learning (such as larger class sizes) the formula $10 * (x - S_{max})/(S_{min} - S_{max})$ was used. In this way 10 represents 'best' and zero represents 'worst' in all cases.

overall resources index is very large at 0.7538 and is significant at the 5 per cent level. Therefore, this data set reasserts that school learning resources are linked to school performance.

Table 9: Spearman Correlation Coefficients Between Test Scores and Resource Indices

	Observations	Learning Resources (R_L)	Teaching Resources (R_T)	**Resources ($\boldsymbol{R}$)**
By Band	5	0.6000	-0.5000	**0.6000**
By School	14	0.6484**	0.0198	**0.7538****

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

3.2.2 School Governance

3.2.2.1 Index Creation

Using the data from a number of surveys and from researcher observation, a number of management indices have been created. The indices created come from the best practice principles as outlined in Chapter 2. In some cases, namely the nested initiatives and minimal recognition of rights principles, it was not necessary to create an index as the result would have been the same for all schools. This is because these principles are influenced by the government structures surrounding the schools and, because all the schools are in the Western Cape, this structure is the same for all schools. In one case, namely the conflict resolution principle, there simply was not enough data to create an index. This is unfortunate, but as is the nature of such a project, not wholly unexpected. In some cases it was not possible to get data on each action situation. However, it is most likely that if the principle is in place at the most basic level (treating the entire school as an action situation) then it will be in place throughout the smaller action situations. The indices created are for: the boundary principle, the collective action principle, the congruence principle, the monitoring principle and a form of the graduated sanctions principle (just called the sanctions principle as it was unable to capture the degree of graduation). The construction of the utilized variables is reviewed below.

3.2.2.1.1 Boundary Principle

The boundary principal captures the degree to which the various roles of managerial positions in the school are understood. The principal requires 'participants and non-participants alike' to understand each role and in this way the

data came from two separate interviews. The first interview was with the principal of the school and the second interview came from another school leader (usually an HOD). The two people surveyed where both asked to explain:

'*What are the main roles and tasks of* [five different management positions]?'[8]

If *both* of the interviewees were able to clearly explain the roles and tasks of a position as outlined by the Department of Education[9] a value of 1 was given but if only one or neither of the interviewees could accurately describe the position a value of 0 was given. Therefore if the principal was able to describe the role of the SGB (being a participant) but the HOD (as a non-participant) could not then the score for this position registered a zero. These dummy variables where then added meaning that a maximum score of 5 could be obtained.

3.2.2.1.2 CONGRUENCE PRINCIPLE

The *congruence principle* requires that the amount a participant benefits is proportional to the amount of time that that participant gives up to fulfill that role. The data used to create this index came from three different questions. First, if the costs and benefits are proportional in a school then it is expected that staff members will be more satisfied in their jobs and so the school leader interviewed was asked:

'How satisfied are teachers in their jobs at this school?'

To respond, the interviewee could select one of three options: very satisfied, quite satisfied or not satisfied. If the response was 'not satisfied' a score of zero was given and if the response was 'very' or 'quite satisfied' a score of one was given.

Secondly, the degree to which the school attempts to relieve extra stress that its teachers may face was evaluated and the question asked was:

'Does the school have a policy on inducting new/newly-qualified teachers into the school?"

If the respondent (in this case the principal) responded in the affirmative and was able to explain the system (usually one of mentoring) then a score of one was give, if not the score was zero.

[8] The positions which they had to explain were the principal, an HOD, the SMT, the SGB and the phase or grade team

[9] For example it was necessary that their description of the role of the SGB had to include a mention of 'governance' as this is the official role of the SGB in South Africa

The third component included in this index is whether the school has more than one admin staff member as a frequent complaint of teachers (especially HODs and other managerial staff) is that admin (unrelated to teaching and learning) consumes too much of their time. Once again the score given was either a one or a zero meaning that a school could achieve a maximum score of 3.

3.2.2.1.3 MONITORING PRINCIPLE

The *monitoring principle* requires that there be active monitoring of the participants. Further it requires that the person doing the monitoring is a participant and in this way if someone is monitoring the staff that person should also be a staff member and not someone from outside the school action situation. For the creation of the index three components of monitoring have been included. The first is general time management (outside of the classroom) as if participants are closely monitored it would follow that they will follow the school's schedule. Four components were included in this subsection, two of which came from observation by the researcher and two that came from the interview with the principal. If the school day was observed to start on time on the days that the researchers were in the school a score of one was given, if it started late the score given was zero. Secondly, the researchers observed the staff sign in register and if it was up to date and functional a one was given. It was the case that all schools in the sample had up to date registers and so this measure was not used. From the principal questionnaire the two questions of importance were:

"Do staff and learners return to class on time after breaks?"
"Is each year plan checked by a senior teacher/HOD?"

All the schools in the set had teachers whose year plans are checked and so this measured was dropped. If the principal affirmed that participants returned to class on time a score of one was given.

The second form of monitoring that is included in the index is administrative monitoring. This included two observed measures: first the researcher observed whether teaching and learning materials are monitored through an up to date LTSM. Second the researcher observed whether there was a central record of student results signed by the principal as this indicates that the principal is aware of and monitors learners progress. A score of one was given for each of these measures.

The final part of the monitoring index is the monitoring of teaching and learning. Two components were included here, first was the frequency of classroom observation based on the following two principal survey questions:

"Are any classroom observations undertaken by the SMT/HOD?"
"Are any classroom observations undertaken by the principal?"

The principal could respond with one of the following three options: 'almost never', 'occasionally' or 'regularly'. If the response was 'regularly' for either of the two questions a score of one was given as it indicates that there is frequent classroom observation by management. The second component of this part of the index came from the following question in the principal questionnaire:

"Are any inspections of learner books or assessment tasks undertaken by the SMT/HOD/principal?"

Once again if the principal answered 'regularly' a score of one was given, otherwise zero. All components considered a school could score a maximum of six for this index.

3.2.2.1.4 SANCTIONS PRINCIPLE

The *graduated sanctions* principle requires that there are sanctions for rule violations but that they start very low and increase in intensity. In this way if a pupil is late for school once a low sanction would be applied (perhaps a 'black dot') but if the pupil is continuously late this punishment would be increased (perhaps to detention). The data for this index came from the following questions:

"Are learners disciplined when they break the school's code of conduct?"
"Are teachers disciplined when they break the school's professional standards of staff?"

The answer to this question could either be 'No, almost never', 'Sometimes, it depends' or 'Yes, definitely'. A score of zero was given for each of these questions if the answer was 'no, almost never' and one otherwise. Further, if the answer was 'yes, definitely' for both questions an additional point was given. The total available for this index was therefore three. Unfortunately there was not enough data available to capture the degree of sanction.
graduation', only the willingness to sanction when a rule violation occurs. Therefore this index has been named the 'sanction index'

3.2.2.1.5 COLLECTIVE CHOICE PRINCIPLE

The *collective choice* principal requires that all parties affected by organizational rules in the school (for example the starting time of the school day) be allowed to participate in making and modifying them. This index is made up of four components which speak to the degree of involvement of different parties within the school. The most obvious collective action group within the school is the SGB. The following question assessed the degree of success that parents and teachers experience in discussing and changing the operational rules in the school:

"How well does the SGB function?"

If the answer to this question was 'not effective' a zero was given, but if the answer was 'it works very well in our school' or 'it functions reasonable well' a score of one was given.

The second component assesses the degree to which all parents are able to be involved in and made aware of the functioning of the school. The question of importance from the survey with the principal is:

"How often does the school hold parent meetings?"

If the answer indicated that the school held meetings once a term or less a zero was given. Schools, which had more frequent meetings, were awarded a one. The next component measured how often staff consult one another on learner results as this indicates the degree to which teaching staff involves on another on decision making. The question here is:

"How often is learner performance discussed in this school?"

If discussion is infrequent or is done only in meetings every term the school received a zero for this measure. If however discussion happens at least weekly and in an informal manner as well as in meetings the school received a one.

The final component included was whether leadership was rated as democratic (as opposed to laissez-faire or authoritarian) as this shows how the staff as a whole is involved in the decision-making. The survey here asked for the participant to check which of the following statements best-described leadership in their school:

"School leaders give orders and supervise work closely"

"School leaders involve staff in decision making and trust that when staff members are given a task they will do a good job"

"School leaders give little input and let staff members work out their problems on their own"

If the second statement (which indicates a democratic relationship) was chosen the school was given a one. If the first or last statement was chosen then the school received a zero. Therefore a maximum score for the collective choice index is four.

3.2.2.2 BAND MANAGEMENT INDEX SCORES

The indices all have been normalized[10] to a maximum of 10 and a minimum of zero. Table 10 below shows the mean indices scored by performance band. These scores have been formulated by normalizing the mean band index scores.

[10] Using the formula: $10(x - S_{min})/(S_{max} - S_{min})$ where S represents the set of index means for the five performance bands.

It is clear that those bands which perform above average comply more strongly to the measured best practice principles than those who perform less well. There is a clear dissimilarity between the scores of the top three bands and the bottom two bands of all the principles. The fact that the average of the top two schools (performance band 1) achieve the highest rating in *all* the measured principles and lowest performance band perform the worst in all but one category is particularly pertinent. In none of the indices do the two below average bands have scores higher than the three above average bands. The scores are frequently arranged from highest to lowest in accordance with the bands and this pattern is repeated when the indices are averaged to give a total management score ('M'). The management score (M) is clearly associated with performance and there is a substantial difference between the score of the 3rd band (7.02) and the 4th band (2.90). This 'drop off point' is not observable in the resources index. When comparing across department the DET schools upper band performs at a close to a factor of ten higher than the lower band (HOR upper band scores are close to three times as high as the lower band). Further, when averaging in terms of high and low performance the high performing schools achieve an average management score of 8.07 which is more than four times higher than the low performing bands' average of 1.89. However, it is important to note that the governance indices may be correlated to unobservables and therefore be over-inflated. For example, it may be the case that there is better monitoring in a school because the parent body is more involved and pressurizes the principal to monitor his teachers' classes. Therefore the monitoring score may be high due to the effect of the parent body rather than the strength of the school managerial body.

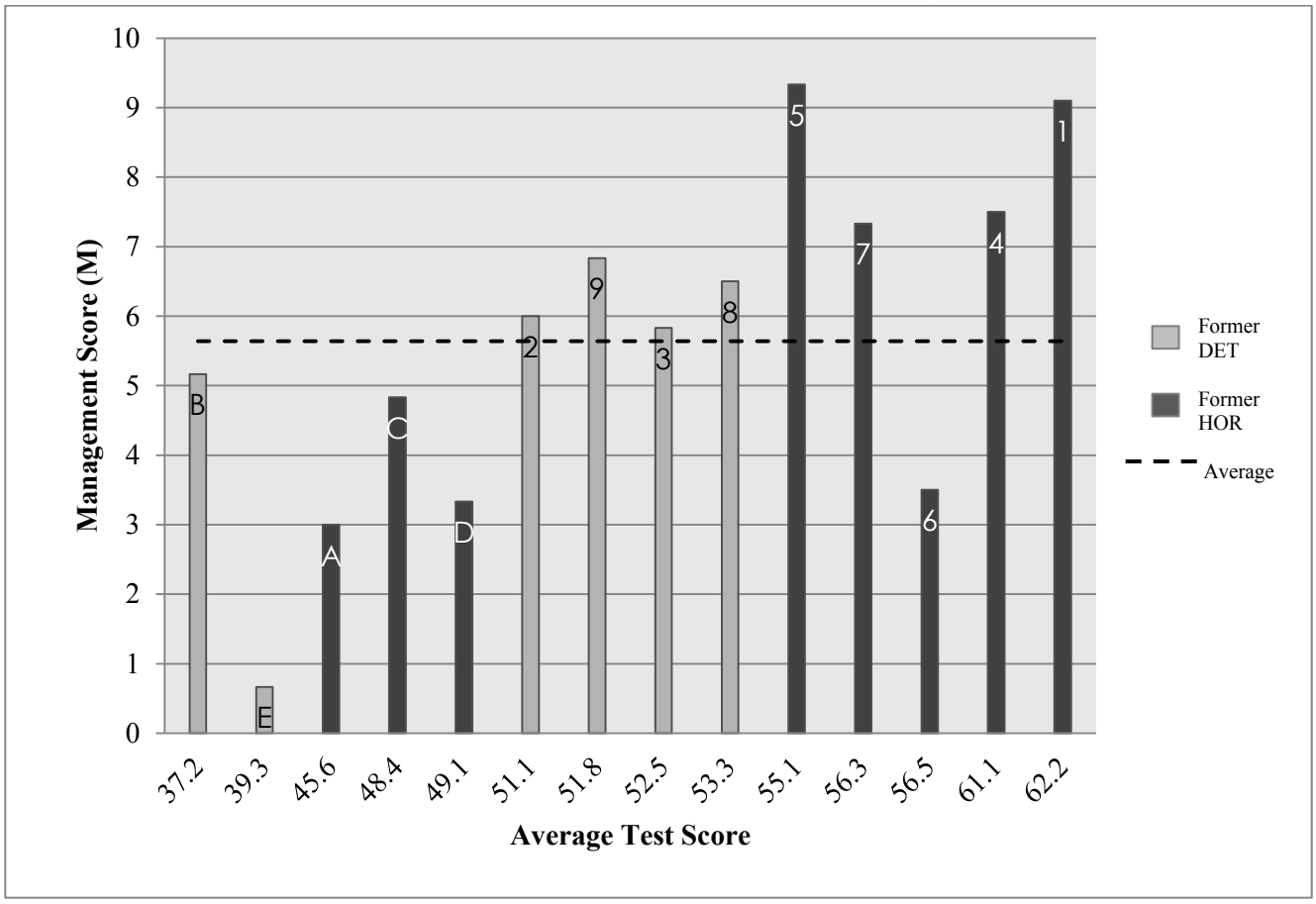
Table 10: Mean School Governance Indices by Performance Band

School Governance Principles	School Performance Band					n=14
	1	2	3	4	5	Mean Diff. (high – low)
Boundary (M_1)	10.00 (0.00)	10.00 (1.73)	9.06 (1.26)	0.00 (0.58)	4.38 (2.12)	7.5**
Congruence (M_2)	10.00 (0.71)	4.44 (1.53)	6.67 (0.82)	2.22 (0.58)	0.00 (0.00)	5.93*
Monitoring(M_3)	10.00 (0.85)	8.97 (1.00)	7.05 (1.26)	4.70 (2.08)	0.00 (2.12)	6.32*
Collective Action(M_4)	10.00 (0.00)	4.67 (0.58)	4.00 (1.00)	2.00 (0.00)	0.00 (0.71)	5.22*
Sanctions(M_5)	10.00 (1.41)	7.78 (1.00)	8.33 (0.50)	5.56 (0.58)	0.00 (1.41)	5.92*
Management Index (M)	**10.00**	**7.17**	**7.02**	**2.90**	**0.88**	
Department Averages	**8.59**		**7.02**	**2.90**	**0.88**	
Overall Performance Average		**8.07**		**1.89**		

Note: Standard deviations for non-normalized scores given in parenthesis
*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level
Source: Author's own calculations based on SPADE data

The management scores (M)[11] for each school are depicted in Figure 7 below. Higher management scores tend to be associated with higher test results, even when they are not averaged by performance band. While the trend is not exactly linear, the association between management and test scores is quite remarkable, especially when comparing across departments. All but one high achieving school attain management scores above the average while all low preforming school score below the average. School 6 appears to be an outlier as it obtains a management score of only 3.50 which is significantly lower than would be expected given its average test score of 56.5 per cent. School 6's score is similar to or lower than the low performing former HOR schools A, C and D and is the only high performing school that falls below the overall management score mean of 5.8. While School E obtains a score of 5.17 which is higher than expected considering it is the school with the lowest test results, it does not appear to be an outlier as it's score is not higher than any of the high performing former DET schools. School 6 causes some problems for the premise than schools need good management scores in order to achieve above demographic expectations and thus is discussed in more detail below.

Figure 7: Management Scores by School



Source: SPADE and author's own calculations

[11] $M = (M_1 + M_2 + M_3 + M_4 + M_5)/5$

3.2.2.3 OUTLIER DISCUSSION

One possible reason that School 6 is an outlier could be that it is embedded in a very different community or have learners and parents with different attributes to the rest of the schools in the sample. It could be the case that the learners at the school achieve higher test results because of higher levels of parent involvement or ability. In larger samples this endogeniety problem could become a serious econometric problem. Table 11 below shows Schools 6's scores for all the measured indices as well as the ranking (out of the 14 schools) for these scores. In terms of family characteristics, School 6 scores lower than expected given that the school obtains the third highest score and low levels of employment and parent education means the school ranks second to last in terms of general family characteristics. The community around the school also scores lower than expected and the school experiences problems with drug and alcohol abuse, low levels of literacy and vandalism interfering with teaching and learning. Overall the community index is ranked 11th out of the 14 schools. School resources, on the other hand, are ranked highly. The school is one of the smaller ones in the sample, equipped with a library and a librarian although average class size stands at 37 and is one of the larger, despite this the school ranks first in learning resources. Although School 6 is only ranked 9th in the teacher quality index, overall it is ranked first in the resource index. While the school may be better resourced than some, it does not seem to be embedded in a superior community than the other schools in the sample. In fact the family and community attributes are ranked very low considering the schools good results.

Table 11: School 6 Indices and Rankings[12]

Index	Index Score	Index Rank
General Family (F_G)	3.56	13
Family Literacy (F_L)	4.11	7
Family Involvement (F_I)	4.28	9
Family Index (F)	**4.00**	**9**
General Community (C_G)	5.27	9
Community Problems (C_P)	3.30	12
Community Index (C)	**4.18**	**11**
Learning Resources (R_L)	8.15	1
Teacher Quality (R_T)	7.68	9
School Resources Index (R)	**8.00**	**1**

Source: Author's own calculations based on SPADE (2012)

[12] The full table of indices by school can be found in the Appendix

Another reason that this outlier exists could be due to managerial change (the hiring of a new principal) since the capturing of the results (which happened between 2002 and 2008) and the capturing of the management indices (which happened in 2012). If this were the case one would hypothesize that more recent test results would be lower than the average from 2002 to 2008. Six of the 14 schools have hired a new principal since 2008. Four of these new principals have only been at the school for a matter of months (less than one year) and are unlikely to have changed the managerial paradigm in such a short time, however there are two schools that hired new principals 4 years ago and School 6 is one of these schools and the low preforming School A is the other.

In order to test the hypothesis that this managerial change may have influenced the school test results the most recent (2011) results are displayed in Table 12 below. There has been a large decrease in School 6's test scores and in 2011 the school achieved an average (numeracy and literacy) Grade 3 score of 43.6 per cent. Some of this decrease can be attributed to the raising of the WCED test standards. However, the school also fell in ranking from third to sixth- this means that it is now the lowest scoring 'above average' former HOR school and is outperformed by one above average former DET school. While there have been some changes in the ranking of the schools' test results, a fall of three positions is the largest downward shift. This change is remarkable considering the new principal has only been in place for four years, and, while the school is still ranked in the top half of the sample, it may be the case that this downward trajectory will continue into the future.

Table 12: Schools 6 WCED Results

	Percent	Rank
WCED Average (2002-2008)	56.5	3
WCED 2011	43.6	6

Source: WCED

Further information arose during the week of research in School 6 as it appeared as if one of the Grade 3 teachers had links to the department of education. It became evident that this teacher was able to acquire 'litnum tests to practice with' from a member of the department although this is not standard procedure. The teacher was therefore able to teach to the test which resulted in her class achieving an incredibly high average of over 80 per cent in the 2011 litnum test while the other Grade 3 teacher's class fared much worse achieving an average of 16 per cent in the same test. It would appear as if this school is subject to a form of predation which actually inflates results in addition to the time discrepancy between the test result and management score measuring being a problem. Because School 6

appears to be an outlier in terms of its management score, and also accounts for more than 7 per cent of the sample, the following statistical analysis also offers results generated with a restricted sample that omits School 6.

3.2.2.4 STATISTICAL ANALYSIS OF THE MANAGEMENT INDICES

3.2.2.4.1 SPEARMAN CORRELATION COEFFICIENTS

In Table 13 below the Spearman correlation coefficients between the management indices and tests scores by band, by school and by the restricted sample of schools are displayed. It is clear that the management index (M) is highly and significantly correlated with test scores. By band the index is perfectly correlated but even when allowing for a greater degree of variability the correlation coefficient remains large. Without dropping the outlier the correlation coefficient is 0.7187, significant at the 5 per cent level. However, when School 6 is dropped from the sample the coefficient increases to 0.8791 and is significant at the 1 per cent level.

Table 13: Spearman Correlation Coefficients Between Test Scores and Management Indices

	Observations	Boundary Index (M_1)	Congruence Index (M_2)	Monitoring Index (M_3)	Collective Action Index (M_4)	Sanctions Index (M_5)	**Management (M)**
By Band	5	0.8721*	0.9000**	1.0000***	1.0000***	0.9000**	**1.0000*** **
By School	14	0.4357	0.4556*	0.6153**	0.7566***	0.2981	**0.7187****
By School (excl. School 6)	13	0.5335*	0.7267***	0.6116**	0.8687***	0.4321	**0.8791*** **

*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Many of the component management indices are also significant and all of them, except sanctions are fairly large in magnitude. In the restricted sample all except sanctions obtain sizeable and significant coefficients of over 0.5. The collective action index is significant at the 1 per cent level in all cases and has the largest coefficient of all the component indices. The congruence and monitoring indices are also significant at at least the 10 per cent level in all cases. Once again, it is important to note that these correlation coefficients could be over inflated as they may include the input of, for example, well-managed schools being imbedded in more engaged communities with parents who value education highly.

3.2.2.4.2 Graphical Representation

A graphical representation of the relationship between each schools management index and test score is shown in Figure 8 below. There is a clear upward trend and those schools which are below average (scoring less than 50 per cent) achieve lower management scores. Figure 9 illustrates the relationships between each of the component management indices and test results for each school and shows that in all cases there is a positive relationship. In no instance does a low performing school achieve an index score of 10 and close to 25 per cent of all below average school scores are zero. Therefore, the graphical representation of the management indices confirms the hypothesized relationship between management and test scores in disadvantaged South African schools.

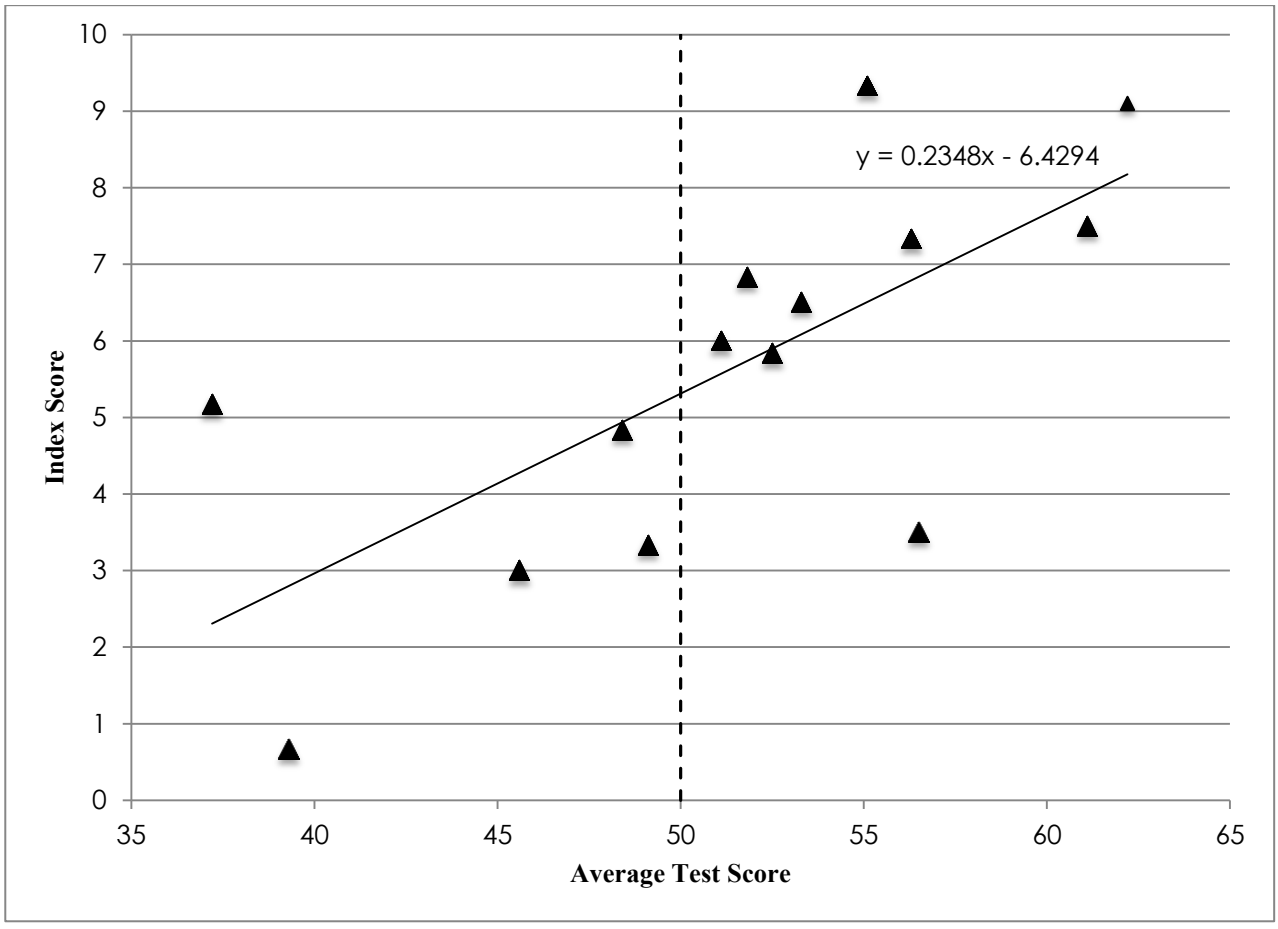


Figure 8: Relationship between management index scores and average test scores

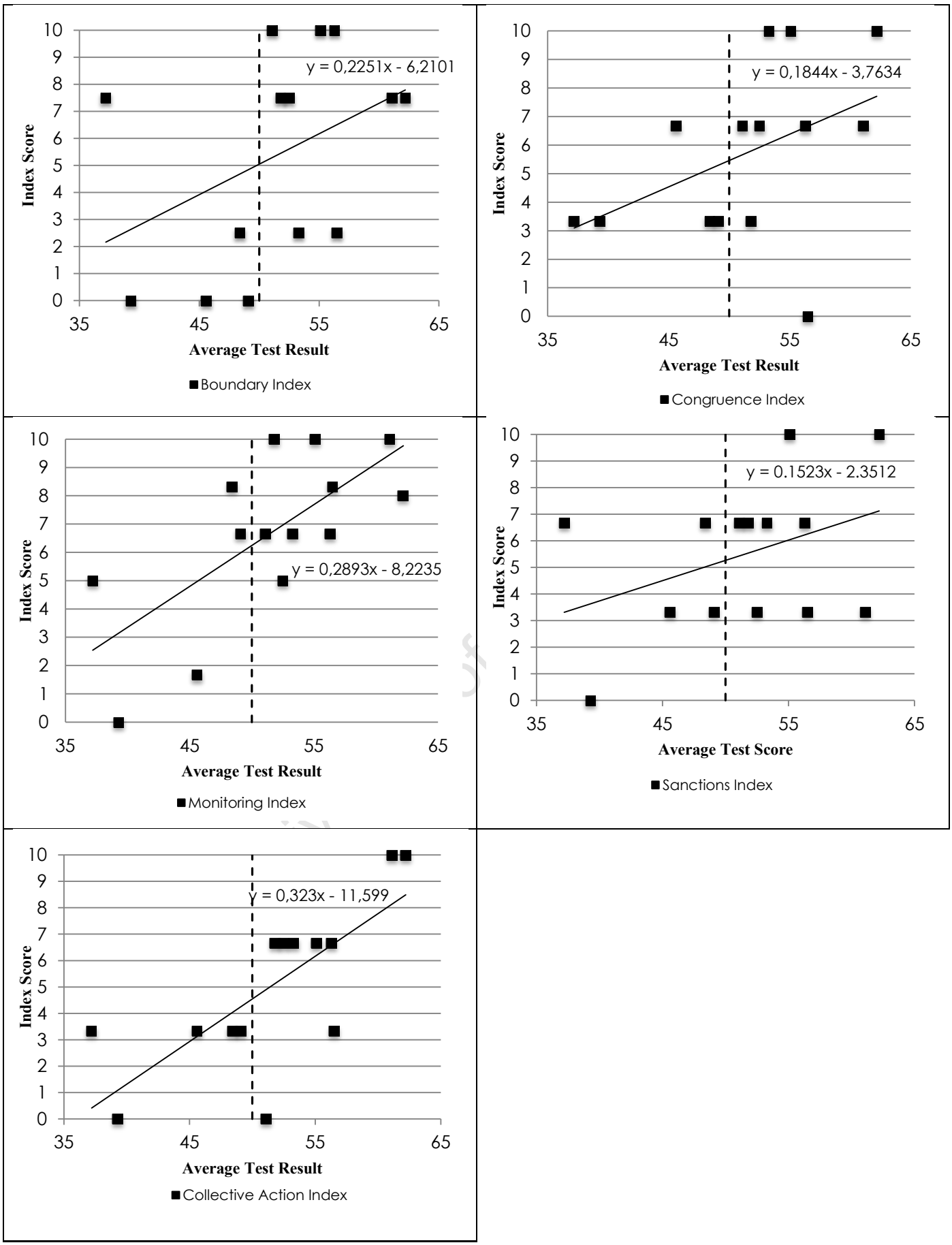


Figure 9: Relationship between component management indices and test scores

3.2.2.4.3 T-Tests Of Mean Differences

Below the results of a t-test to test whether the difference in management index means between high achieving bands (or schools) and low achieving bands (or schools) are given. Once again the restricted sample omits the outlying school, School 6.

Table 14: t-Test of mean differences for the Management index

Test Description	Band	School (Full Sample)	School (Restricted Sample)
Observations: High Achieving	3	9	8
Observations: Low Achieving	2	5	5
Null Hypothesis (H_0)		Difference in mean management indices < 0	
t-statistic	-4.23	-3.52	-4.55
Prob. that means are the same (Pr(T < t))	0.012	0.0021	0.0004
Outcome	Reject	Reject	Reject

In all cases the null hypothesis that there is no difference between the mean management scores in the high performing and low performing schools is rejected. When the bands are tests the t-statistic is -4.23 and the null hypothesis is rejected at the 5 per cent level. In the cases where the restricted and non-restricted school samples are tested the null hypothesis is rejected at the 1 per cent level in both cases. The results indicate that there is a significant difference in the management scores of high achieving as opposed to low achieving, schools. Following this the restricted sample was used to determine whether the mean component management indices (M_1 *to* M_5) differed between high and low achieving schools. The results are given in Table 15.

Table 15: t-test of Mean Differences for the Component Management Indices

Test Description	Boundary	Congruence	Monitoring	Collective Action	Sanctions
t-statistic	-3.66	-2.95	-2.40	-2.68	-1.79
Prob. that means are the same (Pr(T < t))	0.0019	0.0067	0.0178	0.0108	0.0509
Outcome	Reject at 1%	Reject at 1%	Reject at 5%	Reject at 5%	Reject at 10%

The results show that the null hypothesis of zero difference can be rejected for all component management indices.[13] The t-tests show that high and low achieving schools in the sample have statistically significantly different scores for not only the management index, but also for all the component indices.

The statistical analysis in this section unearthed several facts. First, it is clear that the sample contains one outlier due to the break between the collection of test score and management data. This school also experienced high levels of predation. It is clear that the outlying school should be excluded from the analysis as the small sample size means that one outlier can cause large discrepancies in results. The analysis was therefore run with both a restricted and a non-restricted sample. The results indicate that the management index as well as all its component indices are highly correlated with test results result and the Spearman coefficients were significant by band as well as by school. In the restricted sample 4 out of the 5 component indices were highly correlated with test results. Further, a graphical analysis of the data showed that there is a clearly positive relationship between all the management indices and results. Finally, a series of t-tests revealed that the mean management index scores for the high and low achieving schools are statistically different by school and by band even when the outlier was included. This result also held true for all of the component indices and it is clear that school management plays a large role in acquiring higher test results.

3.3 NON SCHOOL-LEVEL VARIABLES

These variables were obtained through learner and parent questionnaires: information was obtained from a total of 1244 learners and 1054 parents across the 14 schools.

3.3.1 Family Characteristics

These variables have been sub-divided into three categories that speak to different aspects of the family. The first are general characteristics of the learners and their parents (or 'caregivers' as some children do not live with their parents). South African legislation states that children may enter school (Grade 1) at the age of 5 provided he or she turns 6 by the 30th of June that year. If a learner's parents feel that he or she is not ready for school then it is also permissible for a child to enter grade one at the age of 6 turning 7. Therefore by Grade 3 children should be between

[13] When this same t-test was run with both bands and the unrestricted sample results were broadly similar with the null hypothesis being rejected for every index between the 10 and 1 per cent level.

the ages of 7 (ages were recorded in May and April) and 9. Children aged 10 and older are 'too old' for their classes and are probably repeaters which should negatively affect test scores. There are a number of older children in all the bands and in the third band (the top preforming DET band) an average of as high as 26 per cent of learners are older than 10 years. Most households speak English at least some of the time, irrespective of their band or their former department[14]. Bearing in mind that all tests in Grade 3 are written in the learner's home language, it is less likely that the frequency of speaking English at this stage would be related to test results and the mean difference is not statistically significant. Employment and education levels are higher in the parent bodies of better performing schools. Main caregiver employment in above average schools is over 60 per cent in all the performance bands (and close to 70 per cent in the top two bands) whereas in the lowest preforming schools this figure is below 50 per cent. The mean difference in employment between the above average and below average bands is statistically significant at the 5 per cent level. While the majority of parents do not have a matric, parents of learners in the top performing schools are more likely to have completed school. Additionally, parents of learners in former DET schools are less likely to have a matric or higher education and in the fifth performance band less than a third of parents have completed school. A large number of learners reported that they do not live with both their parents and this is largely correspondent with school performance band. There is, however, not a huge degree of variation here with the average percent of learners who live with only one or none of their parents falling between 50 and 65 per cent. Once again these variables have been normalized and averaged to create a general family index (F_G) and this is distributed sequentially with the highest preforming schools achieving the highest score (8.59) and lowest performing band achieving the lowest score (2.21)

The second category is 'literacy' and this contains data on the basic literacy practices of both the parents and the child including ownership of books, reading and library membership. Less than half the learners belong to a non-school library and there are very few library members in the fifth band. The higher the performance band, the more likely it seems to be that a learner will own at least one book as over a third of learners in the lower bands own no storybooks. Learners from the top band own the most books with an average of close to seven books per learner. This pattern of ownership is mimicked by the parent reports of the overall number of books in the household with more families having at least 10 books in the upper bands than the lower. Very few families reported having more than 20 books across all performance bands with 11 per cent in the top band being the highest. Households in lower performing schools also have less literate adults living in them, either because of high levels of adult illiteracy or because households have more child residents. Most learners are read to at least once a month by their parents in all the performance bands. The index for the family literacy variable (F_L) is once again higher in the better performing bands, however the top score for this index is actually in band 2 and not band 1 but the lowest score is in the bottom band.

[14] Former department largely determines the language of the school with former DET schools teaching predominantly in Xhosa in the Western Cape and former HOR schools teaching in Afrikaans

Table 16: Mean Family Characteristics by Performance Band

Family Characteristics	School Achievement Band					n=14
	1	2	3	4	5	Mean Diff. (high–low)
GENERAL						
Learners 10 and older	0.13 (0.06)	0.8 (0.05)	0.26 (0.12)	0.13 (0.11)	0.10 (0.03)	0.04
HH that never speak English	0.12 (0.01)	0.19 (0.08)	0.13 (0.04)	0.19 (0.07)	0.17 (0.00)	-0.03
Learners live with both parents	0.65 (0.12)	0.58 (0.12)	0.59 (0.04)	0.60 (0.02)	0.50 (0.03)	0.06
Caregivers employed	0.68 (0.12)	0.67 (0.19)	0.64 (0.05)	0.56 (0.19)	0.49 (0.06)	0.14**
Caregivers with matric or higher	0.42 (0.07)	0.52 (0.28)	0.36 (0.01)	0.34 (0.01)	0.28 (0.07)	0.13
General Family Index (F_G)	**8.59**	**6.96**	**5.01**	**4.07**	**2.21**	
LITERACY						
Number of learner books	6.81 (0.5)	6.73 (2.67)	4.22 (1.83)	3.86 (1.61)	3.68 (0.09)	2.15
Learners with no books	0.15 (0.09)	0.21 (0.18)	0.29 (0.13)	0.33 (0.11)	0.35 (0.02)	-0.12*
Learners' non-school library members	0.47 (0.29)	0.55 (0.28)	0.43 (0.17)	0.40 (0.35)	0.26 (0.07)	0.15
> 10 books in the house	0.38 (0.13)	0.49 (0.11)	0.21 (0.03)	0.33 (0.19)	0.20 (0.09)	0.10
> 20 books in the house	0.11 (0.04)	0.10 (0.02)	0.06 (0.03)	0.06 (0.07)	0.03 (0.01)	0.05*
Literate adults as per cent of total hh	0.61 (0.15)	0.52 (0.01)	0.44 (0.07)	0.48 (0.03)	0.48 (0.01)	0.05
Learners read to less once a month	0.12 (0.05)	0.08 (0.03)	0.06 (0.05)	0.17 (0.04)	0.13 (0.01)	-0.07*
Family Literacy Index (F_L)	**8.39**	**8.55**	**3.60**	**2.40**	**0.84**	
PARENT INVOLVEMENT						
Caregiver has met teacher	0.93 (0.03)	0.93 (0.03)	0.86 (0.08)	0.88 (0.03)	0.85 (0.08)	0.04
Caregiver not visited school this year	0.06 (0.03)	0.04 (0.02)	0.07 (0.02)	0.04 (0.02)	0.08 (0.02)	-0.00
Caregiver aware of week's material	0.57 (0.05)	0.56 (0.11)	0.47 (0.07)	0.43 (0.10)	0.37 (0.07)	0.13*
Good parent meeting attendance	0.50	0.33	0.50	0.00	0.00	0.44***
Clear parent support at school	0.50	0.33	0.25	0.00	0.00	0.36**
Family Involvement Index (F_I)	**8.85**	**8.35**	**4.37**	**3.28**	**0.00**	
Family Index (F)	**8.59**	**8.02**	**4.24**	**3.15**	**0.99**	
Department Index Average	**8.31**	**4.24**	**3.15**	**0.99**		
Performance Band Index Average	**6.95**		**2.07**			

Standard deviations in parentheses
*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

The third group of variables in Table 16 reflects 'parent involvement' in teaching and learning. This includes involvement with the school and with the child's learning. The majority of parents have met their child's teacher and very few have not been to the school with very little variation. There is a more distinguishable difference between parents knowledge of what their child is learning in the upper and lower performance bands. Approximately 20 per cent more parents are aware of what book their child is reading and what concepts they are covering in math in the first performance band compared to the fifth. The data also makes it clear that parents in high performing schools are more supportive of their children's' school. At least half the parent body attends meetings in some (but not all) of the high performing schools, but in no low preforming school is this true. Additionally, more principals reported that their school's parent bodies support teaching and learning in the school in high performance schools- although many stated that parents want to support the school but are ill-equipped to do so. The family involvement index (F_I) is strongly associated with performance with the lowest band registering a zero in all the index components.

An overall 'family index' (F) was constructed by averaging all the normalized components in Table 16. This index is, as expected given previous findings, including the Coleman Report (1966) strongly associated with performance and distributed according to performance bands. The top band scored as high as 8.59 while the bottom band scored a remarkably low 0.99. However, despite the fact that the top three bands scored higher than the bottom two in all the indices, the difference between the third and the forth band is not substantial and there does not seem to be the same 'drop off point' that was evident in the management indices.

The Spearman correlation coefficients between family indices and school results (by band and by school) are given below. All the coefficients are significant at either the 5 or 1 per cent level. The general family index (F_G) has the smallest coefficient by school while the family literacy (F_L) has the biggest at 0.7055. The overall family index (F) is significant at the 1 per cent level by band and by school and achieves a coefficient of 0.7714 by school which is larger than the coefficient found for resources and management using the same sample (but smaller than the coefficient for management using the restricted sample). It is clear that the sample schools' ability to generate academic results is influenced by their learners and parents characteristics, and this is in accordance with the previous literature. The smaller magnitude of F_G coefficient could be related to the fact that the selection process matched high and low performing schools in terms of their demographics meaning that the general characteristics of families (many of which, such as education, are related to wealth) would be similar across schools. The $F_L$and F_I indices are generally not related to wealth (although there is an argument that wealthier families own more books it is more likely that families who value education will own books independent of wealth) and so there is more variation across the bands with better preforming schools having higher scores in these categories.

Table 17: Spearman Correlation Coefficients Between Family Indices and Test Scores

	Observations (n)	General Family Index (F_G)	Family Literacy Index (F_L)	Family Involvement Index(F_I)	**Family Index (F)**
By Band	5	1.0000***	0.9000**	1.0000***	**1.0000*** **
By School	14	0.3890**	0.7055**	0.6527***	**0.7714*** **

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

3.3.2 Community Characteristics

The general community characteristics measured were household size, number of parents who had lived in the community for 6 or more years (well established households), and SES. SES was measured through two means, first learners were asked to circle all the objects that they had at their house out of a list of the following ten items: radio, tv, newspaper, fridge, microwave, inside toilet, hot water, washing machine, car and computer. The second measure was houses that were not made out of brick or concrete as reported by parents. Household sizes are quite large on average with all performance bands having house sizes in excess of 5.50 people and the bottom band having the largest households of 6.33 on average. In general, learners at former DET schools have a lower SES than those at former HOR schools. There is no clear distinction in SES between the upper and lower former DET bands and the quality of housing data indicates that the learners in lower performing DET schools may actually have a higher SES. Because of the selection of 'matching' schools, it is not the case that learners in the top bands come from families with much higher SES than learners in the bottom bands

Most of the schools in the sample experience problems with community that interfere with teaching and learning in the school. Close to 100 per cent of the schools reported problems with low levels of parent literacy and high levels of drug and alcohol abuse. Other issues are less widespread and violence and problems with gangs seems to be more prevalent in former HOR school areas while some schools in all the performance bands experience vandalism problems, often committed by learners. Another facet that has been included here is the number of parents that reported having no involvement in the community (this means that they are not part of any community organization, sports club or church). Parents in former DET schools tend to be much more involved in the community than those in former HOR schools. The community problems index is seemingly uncorrelated with results with the index score being very low in the two top preforming bands and the highest score being found in the bottom band. Overall the community index is very similar across the high performing and low performing bands with the second band obtaining the lowest score due to the levels of violence, low literacy and alcohol abuse. Overall there is less than a 1.5 point difference between above average and below average community index scores, and the below average schools score higher. Additionally, in only one instance is the mean difference between the high achieving bands and low achieving bands statistically significant.

Table 18: Mean Community Characteristics by Performance Band

Community Characteristics	School Performance Band					n=14
	1	2	3	4	5	Mean diff. (high-low)
GENERAL						
Average household size	5.69 (0.59)	5.86 (1.09)	5.48 (0.35)	5.69 (0.52)	6.33 (0.19)	-0.33
Per cent of established HH	0.76 (0.07)	0.80 (0.06)	0.70 (0.12)	0.81 (0.11)	0.78 (0.04)	-0.04
Per cent with brick houses	0.75 (0.03)	0.81 (0.05)	0.45 (0.19)	0.68 (0.11)	0.71 (0.22)	-0.03
SES proxy (out of 10)	8,29 (0.16)	7,98 (1.05)	6,23(0.63)	7,20 (0.64)	6,86 (0.49)	0.47
General Community Index (C_G)	**7,85**	**8,36**	**2,50**	**7,18**	**4,36**	
PROBLEMS						
Parents not involved community	0.15 (0.11)	0.17 (0.02)	0.02(0.01)	0.20 (0.01)	0.03 (0.02)	0.00
Violence/Gangs	0.50	0.67	0.25	0.67	0.50	-0.11
Drugs/Alcohol	1	1	1	0.67	0.50	0.42***
Low Literacy	1	1	1	0.67	1	0.17
Vandalism	0.50	1	0.50	0.33	0.50	0.25
Community Problem Index (C_P)	**2.83**	**0.32**	**5.50**	**5.33**	**6.25**	
Community Index (C)	**5.06**	**3.90**	**4.17**	**6.16**	**5.41**	
Department Index Average	**4.48**		**4.17**	**6.16**	**5.41**	
Performance Index Average		**4.37**			**5.78**	

Standard deviations in parentheses
*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

The Spearman correlation coefficients are given once again, this time between the community indices and test scores by band and by school. Counter-intuitively, the community problem index appears to be negatively correlated to school results (those schools which experience greater problems with the community actually do better than those with less problems). The distinctly different communities surrounding former-HOR as opposed to former-DET schools could explain this. Therefore, although the former HOR form the higher bands (bands 1, 2 and 4 as opposed DET band 3 and 5) they tend to have parents who are less involved in the community and have a higher prevalence of gangs and violence. However, none of the correlation coefficients are significant, even at the 10 per cent level.

Table 19: Spearman correlation coefficients between community indices and test scores

	Observations (n)	General Community Index (C_G)	Community Problems Index (C_P)	**Community Index (C)**
By Band	5	0.6000	-0.8000	**-0.6000**
By School	14	0.3055	-0.1298	**0.0769**

*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

3.4 Summary of Results

In Table 20 below the previously discussed Spearman correlation coefficients are given by band and by school for the four major indices.

Table 20: Summary of Spearman Correlation Coefficients

	By Band	By School
Resources	0.6000	**0.7538****
Management	1.0000***	**0.8791***[15]
Family	1.0000***	**0.7714*****
Community	**-0.6000**	**0.0769**

significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

The findings broadly reassert many of the findings found in a review of the previous literature: school resources used for learning are highly correlated with test outcomes. Interestingly, this dissertation did not find a significant correlation between teaching resources and school results, but this may be because the proxy used for teacher quality was insufficient and a more nuanced approached needs to be undertaken. A second finding was that family plays an important roll in school test results: the general characteristics of the family (including employment and education)

[15] This result was gained using the restricted sample. Using the unrestricted sample gave a coefficient of 0.7187, significant at the 5 per cent level. Using the restricted sample, no other Spearman coefficient (for family, resources or community) is higher than 0.8791.

and the involvement of the family in schooling (including visits to the school and awareness of learning material) are both significant in generating test results. However, the strongest relationship can be found between the family literacy index and test results and it appears as if the number of books that learners and their parents own or have access to is highly correlated to test results. The community characteristics on the other hand (including SES, a particularly well reviewed variable in the literature) do not seem to be highly or significantly correlated to test results. This may be due to the process of school selection as high achieving schools were 'matched' to low performing schools embedded in similar communities. Most interestingly given the hypothesis of this dissertation, the highest correlation was found between school management and school results. It appears as if school results are not independent of management and that management may be the most important factor in determining results in this sample.

To test this theory further the following education production function model was run using ordinary least squares (model 1):

$$Results = \alpha + B_1F + B_2M + B_3C + B_4R + \mu$$

Where the dependent variable 'Results' is the vector of 2011 litnum results by school[16], F is the family index, M is the management index, C is the community index and R is the resource index for each school and μ is the error term. Before the results are presented it is essential to note that there is a significant caveat to this regression. The sample is problematic due to its small size (14 schools in total). Therefore, while the results reported hold true for this sample, it is important to not give them too much weight, as it is unlikely that they can be extrapolated to represent the entire population of schools in South Africa. In order to gain a more valid result one would need to significantly increase the sample size.

The OLS results are presented in Table 21. In brief the results from model 1 show that the management index and the resources index are the only indices that have a significant effect on test results in the sample. Family is jointly significant with the management index at the 1 per cent level and it appears they are quite highly correlated with a correlation coefficient of 0.802 significant at the 1 per cent level. It may be the case that good school management promotes literacy interests in learners and parents and encourages parents' interest in their children's learning. When the same regression is run without the management index (model 2), the family index is positive, large and significant at the 5 per cent level. In the primary model, management is significant at the 5 per cent level and has a coefficient of 2.254, therefore if a school were to increase its overall management index by 5 points the school's WCED test results would increase by over 11 per cent. The resource index has an even larger coefficient, although it is only significant at

[16] The 2011 results are used as in this way there is no discrepancy between the test results and the management scores and therefore School 6 can be included in the sample.

the 10 per cent level. While the results are limited and can not go very far in disentangling underlying relationships, it is clear that management is a very important input into the education production function in the sample of schools used in this paper.

Table 21: OLS estimates for the effect of various indices on school tests results

Dependent Variable: 2011 WCED Grade 3 test results		
	(1)	(2)
Family Index (F)	-.080 (1.152)	2.337** (1.004)
Management Index (M)	2.254** (0.799)	-
Community Index (C)	.029 (0.824)	-.120 (1.070)
Resources Index (R)	3.429* (1.522)	3.014 (1.973)
Constant (_cons)	6.420 (8.900)	4.887 (11.567)
Observations (n)	14	14
Adj. R^2	0.6775	0.4532

Standard errors in parenthesis
significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

CHAPTER 4 Conclusion

4.1 Overview Of The Paper

A review of the literature in Chapter 1 made it clear that while much research has been done on the determinants of learner results, the findings on the effect of school management are often inadequate as the measurement of this component is largely inconsistent and subjectively determined. This dissertation hopes to overcome the problems associated with measuring school management through using a previous literature on governance as a base to build a benchmarking system for schools. For this reason, the Institutional Analysis and Design framework, developed by Elinor Ostrom and her colleagues (1990, 1994, 2005, 2010) over the course of the last 30 years, is central to this paper. The framework is described at length in Chapter 2, and the best practice principles, which are core to the IAD framework, formed the basis of this paper's hypothesis:

Schools which are able to produce good academic results in adverse situations have management systems that subscribe more closely to the best practice principles as outlined by Ostrom than those schools in similar situations which produce poor results.

In order to test this hypothesis, management indices were built for a sample of 14 public schools in the Western Cape. A total of five component management indices and one aggregate index were built for each school using the highly detailed data provided by the UCT SPADE project. In addition to the management indices a number of control indices were build for components that have previously been found to influence learner test scores. This included several family variables, community variables and measures of school resources. Following the construction of the indices, a number of statistical tests were run in order to determine the validity of the hypothesis.

4.2 Synthesis of Results

Spearman correlation coefficients were estimated for each index and the relevant school test results. It was found that school management has the largest and most significant coefficient and that many of the component management indices were also significant. The coefficient on the management index was a full 10 per cent higher than the coefficient on the family index implying that management is more highly correlated to learner results. This result is interesting considering that family background effects are most frequently cited as being the most important determinant of test results. Overall the Spearman index results indicate that management could be more significant

than any other variable in the determining of learner test results. This result was reasserted by two other means. First, graphical representations of the management indices showed that there was a clear positive relationship between management and test scores in the sample. Secondly, t-tests of mean differences showed clearly that, on average, high performing schools achieve higher management scores than low performing schools, significant at the 1 per cent level. Additionally, further t-tests illustrated that this same trend held true for each of the component indices. It appears that those schools that achieve results above demographic expectations have management systems that subscribe more closely to the Ostrom best practice principles than those schools that do not perform as well in the same context.

Although the sample size is problematic, OLS estimates showed that the coefficient of the management index was significant and large indicating that management is an important determinant of school test results in the sample. The OLS estimates also showed that the family index is influenced by the management index indicating that good school management promotes literacy habits and involvement in learning by parents.

All finding from this paper have shown that management is a crucially important determinant of learner test results in the Western Cape.

4.3 Limitations of The Study and Recommendations for Further Research

There was a clear limitation to this study in that the sample size was too small to be representative of the full population of schools in the Western Cape. This was due to the selection technique used by the SPADE project. However, while the sample size did limit econometric analysis, the data collected by SPADE is of a very detailed nature. It was this level of detail that allowed for the creation of the management indices and certainly the results do indicate that there is an interesting relationship between management (as measured by the best practice principles) and learner results within the sample. In order to determine whether this relationship is casual and holds at the population level it is necessary for the sample size to be increased while using the same management measurement techniques employed by this paper.

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Appendix

Appendix Table 1: Family Indices by School

School Pseudonym	1	2	3	4	5	6	7	8	9	A	B	C	D	E
Test Score	62.20	51.10	52.50	61.10	55.10	56.50	56.30	53.30	51.80	45.60	39.30	48.40	49.10	37.20
GENERAL														
Older than 10	8.08	6.76	0.72	5.72	7.79	7.47	9.97	5.37	**0.00**	6.94	8.60	3.90	**10.00**	7.23
HH that never speak English (%)	8.74	7.62	8.83	9.02	5.10	4.84	9.41	6.97	9.88	**10.00**	7.01	9.50	**0.00**	6.87
Learners live with both parents (%)	**10.00**	5.84	2.41	3.62	**0.00**	3.07	9.10	4.66	4.01	5.27	1.94	4.90	3.91	0.14
Caregivers employed (%)	3.96	3.66	5.20	7.82	5.61	1.47	**10.00**	6.10	5.47	2.00	0.60	8.02	**0.00**	2.62
Caregivers with matric or higher (%)	2.32	1.29	1.28	4.05	3.53	0.94	**10.00**	2.94	3.65	1.94	**0.00**	1.94	1.80	1.73
Average (F_G)	**6.62**	**5.03**	**3.69**	**6.05**	**4.41**	**3.56**	**9.70**	**5.21**	**4.60**	**5.23**	**3.63**	**5.65**	**3.14**	**3.72**
LITERACY														
Average number of learner-owned books	6.43	1.20	5.92	5.45	4.65	2.86	**10.00**	2.22	0.06	1.22	1.50	4.33	**0.00**	1.69
Learners with no books (%)	6.21	0.61	8.93	9.73	8.55	1.02	**10.00**	5.00	2.48	4.06	2.24	5.48	**0.00**	3.09

Learners non-school library members (%)	2.13	0.84	5.19	8.22	**10.00**	1.89	6.96	5.91	6.12	2.26	1.39	9.84	**0.00**	2.75
More than 10 books in the house	3.19	2.19	1.73	6.88	6.54	5.49	**10.00**	1.54	0.71	2.16	**0.00**	8.31	1.15	2.65
More than 20 books in the house	6.01	7.29	4.05	**10.00**	6.62	7.01	8.83	2.39	4.20	3.28	2.02	9.71	**0.00**	1.62
% of literate adults in house	3.72	0.86	**0.00**	**10.00**	4.47	3.72	4.52	1.61	4.94	2.50	3.12	3.79	2.42	2.62
Learners read to less once a month (%)	2.99	7.60	6.07	6.50	7.64	6.81	5.24	5.24	**10.00**	3.93	4.16	2.21	**0.00**	3.70
Average (F_L)	**4.38**	**2.94**	**4.55**	**8.11**	**6.93**	**4.11**	**7.94**	**3.41**	**4.07**	**2.77**	**2.06**	**6.24**	**0.51**	**2.59**
INVOLVEMENT														
Caregiver has met teacher (%)	8.94	5.90	7.73	7.31	**10.00**	8.44	6.91	**0.00**	6.74	6.64	7.59	4.71	7.19	2.24
Caregiver not visited school this year (%)	7.68	5.84	6.01	3.30	**10.00**	6.11	5.30	**0.00**	3.91	9.05	4.50	4.60	9.19	2.00
Caregiver aware of week's material (%)	6.10	6.53	4.18	8.06	3.70	6.88	**10.00**	1.73	4.39	3.35	2.97	0.06	5.84	**0.00**
Schools with good meeting attendance	10.00	10.00	10.00	10.00	0.00	0.00	10.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00
Clear parent support at school	10.00	0.00	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average (F_I)	**8.55**	**5.65**	**7.58**	**5.74**	**6.74**	**4.28**	**6.44**	**2.35**	**5.01**	**3.81**	**3.01**	**1.87**	**4.44**	**2.85**
Overall Average (F)	**6.52**	**4.54**	**5.28**	**6.63**	**6.02**	**3.98**	**8.02**	**3.66**	**4.56**	**3.94**	**2.90**	**4.59**	**2.70**	**3.05**

Appendix Table 2: Resource Indices by School

School Pseudonym	1	2	3	4	5	6	7	8	9	A	B	C	D	E
Test Score	62.20	51.10	52.50	61.10	55.10	56.50	56.30	53.30	51.80	45.60	39.30	48.40	49.10	37.20
LEARNING														
Library	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**	0.00	**10.00**	**10.00**	0.00	0.00	0.00	**10.00**	0.00
Library and Librarian	0.00	0.00	**10.00**	**10.00**	**10.00**	**10.00**	0.00	**10.00**	**10.00**	0.00	0.00	0.00	0.00	0.00
Class size	7.50	4.57	6.85	4.57	4.57	3.26	**10.00**	3.70	4.73	2.93	6.09	6.74	0.00	3.26
School size	1.68	2.13	0.00	0.88	5.80	9.35	9.43	5.23	4.77	3.31	5.01	8.72	**10.00**	8.07
Average (R_L)	**4.79**	**4.17**	**6.71**	**6.36**	**7.59**	**8.15**	**4.86**	**7.23**	**7.37**	**1.56**	**2.77**	**3.87**	**5.00**	**2.83**
TEACHING														
Average years experience	7.89	4.27	1.89	**10.00**	8.29	5.37	7.56	5.12	0.00	8.44	4.31	6.99	**10.00**	6.10
REQV less than 13	**10.00**	**10.00**	**10.00**	5.00	0.00	**10.00**	**10.00**	**10.00**	5.00	**10.00**	**10.00**	**10.00**	5.00	**10.00**
Average (R_T)	**8.94**	**7.13**	**5.95**	**7.50**	**4.15**	**7.68**	**8.78**	**7.56**	**2.50**	**9.22**	**7.15**	**8.50**	**7.50**	**8.05**
Overall Average	**6.87**	**5.65**	**6.33**	**6.93**	**5.87**	**7.92**	**6.82**	**7.40**	**4.94**	**5.39**	**4.96**	**6.18**	**6.25**	**5.44**

§Appendix Table 3: Management Indices by School

School Pseudonym	1	2	3	4	5	6	7	8	9	A	B	C	D	E
Test Score	62.20	51.10	52.50	61.10	55.10	56.50	56.30	53.30	51.80	45.60	39.30	48.40	49.10	37.20
PRINCIPLE														
Boundary	7.50	**10.00**	7.50	7.50	**10.00**	2.50	**10.00**	2.50	7.50	0.00	0.00	2.50	0.00	7.50
Congruence	**10.00**	6.67	6.67	6.67	**10.00**	0.00	6.67	**10.00**	3.33	6.67	3.33	3.33	3.33	3.33
Monitoring	8.00	6.67	5.00	**10.00**	**10.00**	8.33	6.67	6.67	**10.00**	1.67	0.00	8.33	6.67	5.00
Collective Action	**10.00**	0.00	6.67	**10.00**	6.67	3.33	6.67	6.67	6.67	3.33	0.00	3.33	3.33	3.33
Sanctions	**10.00**	6.67	3.33	3.33	**10.00**	3.33	6.67	6.67	6.67	3.33	0.00	6.67	3.33	6.67
Average (*M*)	**9.10**	**6.00**	**5.83**	**7.50**	**9.33**	**3.50**	**7.33**	**6.50**	**6.83**	**3.00**	**0.67**	**4.83**	**3.33**	**5.17**

Appendix Table 4: Community Indices by School

School Pseudonym	1	2	3	4	5	6	7	8	9	A	B	C	D	E
Test Score	62.20	51.10	52.50	61.10	55.10	56.50	56.30	53.30	51.80	45.60	39.30	48.40	49.10	37.20
GENERAL														
Average household size	4.88	6.13	6.83	8.97	8.21	0.00	**10.00**	9.42	9.34	8.16	4.44	8.59	3.99	3.15
Percent of established HH	7.24	8.14	0.00	4.59	8.56	7.61	5.38	4.96	3.48	4.02	5.60	**10.00**	8.09	7.25
Percent with brick houses	8.66	5.57	0.00	7.97	9.18	8.50	9.82	6.21	4.21	8.94	5.53	7.31	5.76	**10.00**
SES proxy (out of 10)	7.24	1.10	3.50	7.86	5.19	4.98	**10.00**	3.27	0.00	5.31	2.73	5.88	2.64	4.62
Average (C_G)	7.00	5.23	2.58	7.35	7.79	5.27	8.80	5.96	4.26	6.61	4.58	7.95	5.12	6.26
PROBLEMS														
Percent of parents not involved community	0.00	9.62	8.97	7.03	2.08	3.51	2.38	9.88	9.74	1.94	**10.00**	0.68	1.38	8.67
Violence/Gangs	0.00	0.00	10.00	10.00	0.00	10.00	0.00	10.00	10.00	0.00	0.00	10.00	0.00	10.00
Drugs/Alcohol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00
Low Literacy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
Vandalism	0.00	0.00	10.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	10.00	10.00
Average (C_P)	**0.00**	**1.92**	**5.79**	**5.41**	**0.42**	**2.70**	**0.48**	**5.98**	**3.95**	**0.39**	**4.00**	**8.14**	**2.28**	**5.73**

Overall Average (C)	**3.50**	**3.58**	**4.19**	**6.38**	**4.10**	**3.99**	**4.64**	**5.97**	**4.10**	**3.50**	**4.29**	**8.04**	**3.70**	**6.00**