Report to

The United Nations Children's Fund, Zimbabwe

Zimbabwe Early Learning Assessment (ZELA) 2015 Evaluation Report

Evaluation of the Education Development Fund Program

from

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[Written by UNICEF?]

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Foreword

[Written by UNICEF?]

Abbreviations and acronyms

ACER	Australian Council for Educational Research
AFM	Apostolic Faith Mission Church
BEAM	Basic Education Assistance Module
BEGE	Basic Education and Gender Equality
BESO	Basic Education System Overhaul
ECD	Early Childhood Development
ECOSOC	Economic and Social Council
EFA	Education for All
EDF	Education Development Fund
IRT	Item Response Theory
MC	Multiple Choice
MDG	Millennium Development Goal
MLA	Monitoring Learning Achievement
MoESAC	Ministry of Education, Sport, Arts and Culture
MoPSE	Ministry of Primary and Secondary Education
NGO	Non-Government Organization
OECD	Organisation for Economic Co-operation and Development
OVC	Orphans and Vulnerable Children
PD	Professional Development
PISA	Programme for International Student Assessment
TMO	Test Monitoring Officer
SACMEQ	Southern Africa Consortium for Monitoring Educational Quality
SDG	Sustainable Development Goal
SES	Socio-Economic Status
UNESCO	United National Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
ZELA	Zimbabwe Early Learning Assessment
ZIMSEC	Zimbabwe School Examinations Council
ZimVAC	Zimbabwe Vulnerability Assessment Committee

Executive summary

After gaining independence in 1980, the Government of Zimbabwe expanded access to primary school education, which resulted in the number of primary school enrolments more than doubling in seven years. By 1982 primary enrolment rates were reported at almost 100 per cent (Nyanguru & Peil, 1991). However, the deterioration in the country's economy beginning in 2000 had serious negative impacts on the delivery of education services (Government of Zimbabwe/United Nations, 2010, p. 48; Government of Zimbabwe, 2009). A high unemployment rate and hyperinflation that peaked in Zimbabwe in 2008 created an unstable environment in which Zimbabwe lost substantial investment in education and there was an exodus of skilled workers including teachers (Kwenda & Ntuli, 2014).

In 2009 the sector slowly began to recover, with education being a priority in the new government's Short Term Emergency Recovery Programme (Government of Zimbabwe, 2009); and, in 2012, international education data indicated increases in enrolments and improvements in the education system. The UNESCO Institute for Statistics reported a total net enrolment rate of 93.9 per cent in primary schools (with a gross enrolment rate of 109.2 per cent) (UNESCO, 2015).

In this complex education environment, the Education Transition Fund (ETF), launched by Zimbabwe's Ministry of Education, Sport, Arts and Culture (MoESAC), supplied all Zimbabwean primary schools with resources aimed at attaining quality education and access for all in 2010 (UNICEF, 2011). The intervention included the provision of textbooks (English, Mathematics, Shona, Ndebele and Environmental Science) and the establishment of supporting resources related to the use of these books in schools. The second phase of the ETF was reoriented as the Education Development Fund (EDF) and included a focus on supporting the systems and structures that provide education, including Zimbabwe's teachers in providing quality education (UNICEF 2011, p. 2).

The Zimbabwe Early Learning Assessment (ZELA) is a four-year program that monitors and evaluates the effects of those resources procured through the ETF. The partnership between Zimbabwe School Examinations Council (ZIMSEC) and the Australian Council *for* Educational Research (ACER) designed and managed ZELA, which measures student performance in languages and Mathematics. ZELA established a baseline in order to determine change in pupil performance from 2012-2015; to explore the relationships of pupil, teacher and school level variables on pupil learning outcomes; and, to investigate the extent that test performance can be attributed to the ETF. In 2013, the ZELA program was expanded to support and enhance national capacity in student assessment.

Key Findings

Improvements in pupil performance in English and Mathematics between 2012-2015

The study explored how Zimbabwe pupils performed in assessments of language and Mathematics over time. The overall mean English performance increased by a small amount over 2012-2015, although the percentage of students at or above grade level did not increase during that period. However, a large increase was observed in mean performance for Mathematics, as well as an increase in the percentage of students at or above grade level between 2012 and 2015.

Relationships of pupil, teaching and school characteristics with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe

The research explored the relationships of pupil, teaching and school variables with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe. As with each year of ZELA, girls consistently outperformed boys in both English and Mathematics, but the difference was small. Pupils in urban areas performed better in both subjects than their peers in rural areas. The gap in English performance increased over time. In addition to this, there were large differences in pupil performance in English and Mathematics between provinces.

Socio-economic equity in education is defined as providing all students, regardless of socio-economic status with similar opportunities to benefit from education (OECD, 2013). ZELA analyses confirmed that there was a strong relationship between pupils' performance and their socio-economic background, and that the gap in performance between pupils from low and high socio-economic backgrounds decreased between 2012 and 2015. These results could be a sign of improved learning opportunities for all.

Findings from in-depth interviews and consultations at eight schools enabled an exploration of characteristics of low- and high-performing schools. The findings provided a snapshot of a range of educational contexts in Zimbabwe from the perspectives of people who engage with their schools, school communities and districts on a daily basis. Stakeholders consulted for the school case studies acknowledged that the initial distribution in 2010 of textbooks and resources benefited their schools in variety of ways. Stakeholders suggested that perhaps more access to resources, funding and employment, would result in schools being better able to maintain critical infrastructure, retaining teachers and providing safe learning environments for pupils.

Importantly, ZELA reveals that the interaction of a range of variables that were associated with pupil performance in English and Mathematics in Zimbabwe is complex. While the data showed that nationwide pupils from registered schools outperformed pupils from satellite schools in both English and Mathematics, the difference was much larger in urban areas than in rural areas. Pupils from registered schools in rural areas performed relatively low - their performance was approximately equal to pupil performance in satellite schools in urban areas. Furthermore, the distance between the school and the district centre had an additional negative association with performance in rural areas.

Pupils attending schools with water and electricity performed better in English and Mathematics than pupils without water and/or electricity. This gap for English grew between 2012 and 2015. In any

case, other factors such as differences in school budgets, school educational resources and family socio-economic status could be the explaining factors for this relationship.

Analyses regarding the size of the school budget revealed that pupils in schools with large budgets performed better than pupils in schools with a medium budget in both rural and urban areas. This difference was smaller in 2015 than in 2012. The data showed that pupils who had not been absent from school performed better than pupils who had been absent for one or two days in a term. Those pupils, in turn, performed better than pupils who were absent for three or more days.

It is plausible that students who are in school more have more opportunities to learn. However, as with all results presented in this report, any relationship is not necessarily causal. For example, pupils who are absent more may have less support from their families to do well at school, they may need to work for the family, or live in areas where priorities are different.

The extent that improvement in test performance can be attributed to the Education Transition Fund (ETF)

Finally, the study explored the extent to which textbooks and resources distributed under the ETF had an effect on pupil performance. The results from the multiple regression analysis revealed that possible changes in location (urban versus rural and distance between the school and the district centre), socio-economic status, gender, school type, budget, pupil absenteeism and the proportion of qualified teachers between 2012 and 2015 did not explain the increase in English or Mathematics performance. Furthermore, differences in family socio-economic status and included teaching and learning conditions explained a large part of the difference between urban and rural areas and some of the difference between more and less rural schools. Teaching and learning conditions also seemed to soften the effect of socio-economic status somewhat.

The fact that any changes between the assessment years in the included background or teaching and learning variables did not explain the increase in English or Mathematics performance suggests that the positive trends were caused by other factors. An obvious and plausible factor is the distribution of textbooks and resources under the ETF.

Policy implications and Future Directions

Tracking the evolution of these disparities over time can help the Zimbabwe school system monitor whether and how inequities in education opportunities and outcomes are growing or shrinking. Analysing and measuring these results has a number of policy implications, some of which are already being addressed in the school system in Zimbabwe.

Based on the evidence, incentives that would attract teachers to rural areas through improved housing and infrastructure could produce a flow-on effect for the quality of instruction. Incentives to encourage pupils to attend school is another implication that could include a range of initiatives, for example improving infrastructure or educating families to support education. In addition, targeted school funding schemes in rural areas and for students from low SES backgrounds have the potential to address equity issues with the implication to develop and continue supporting programs for disadvantaged pupils and families, in addition to improving conditions in rural areas.

Implications might also include reviewing the evidence on school budgets and pupil performance and developing targeted funding programs that support an equal level of budget per pupil per year in all

schools. A final implication is to explore the development of programs to replace textbooks and resources, or purchase new textbooks and resources. Overall, the answer to addressing equity issues in Zimbabwe schools may be a combination of providing resources and funding, and supporting schools that are accountable and well-managed.

This 2015 evaluation report has provided a comprehensive analysis of the relationship of a range of school, teaching and pupil variables that are related to pupil performance in English and Mathematics at Grade 3. The analysis of trends over the four-year period of ZELA has the potential to enable policymakers to make informed, evidence-based decisions about how to improve the learning outcomes of pupils in Zimbabwe, particularly at the primary level of schooling.

ZELA is the first instance that a national assessment of the early grades has been established in Zimbabwe over an extended period of time (2012-2015); and, ZELA is the only ongoing national assessment in the Eastern and Southern African region. ZELA's body of evidence fulfils the purpose of the UN Sustainable Development Goals (SDGs), by exploring the links between pupil performance and pupil, teacher and school level variables. Such a large scale assessment program has the potential to provide a roadmap to target the commitment of resources. With this in mind, ZELA has developed a knowledge and evidence base to support decisions for the education system, particularly early grades learning, in Zimbabwe.

Chapter 1 – The Education Development Fund, the Right to Education and Context of the ZELA Program

Since 1946, UNICEF has worked to ensure the rights of all children and, guided by the Convention on the Rights of the Child, the Millennium Declaration and Education for All, this has included the right to education. UNICEF Zimbabwe supports the country's efforts to provide access to quality education for boys and girls through improved learning outcomes, and equitable and inclusive education (UNICEF, 2014c).

In 2010 the ETF supplied all Zimbabwean primary schools with resources aimed at attaining quality education and access for all (UNICEF, 2011). The intervention included the provision of textbooks (English, Mathematics, Shona, Ndebele and Environmental Science) and the establishment of supporting resources related to the use of these books in schools. The second phase of the ETF was reoriented as the EDF and included a focus on supporting the systems and structures that provide education, including Zimbabwe's teachers in providing quality education (UNICEF 2011, p. 2).[1]

The Zimbabwe Early Learning Assessment (ZELA) is a four-year program that monitors and evaluates the effects of those resources procured through the ETF. The partnership between Zimbabwe School Examinations Council (ZIMSEC) and the Australian Council *for* Educational Research (ACER) has designed and managed ZELA, which measures student performance in languages and Mathematics. In 2013, the ZELA program was expanded to support and enhance national capacity in student assessment.[2]

This report relates to Phase Two of the ETF, and documents the 2015 ZELA evaluation cycle. The evaluation cycle conducted in 2015 builds on the baseline data collected in 2012 for the evaluation of the ETF program. The main focus of this report is to describe how performance in 2015 compares to performance in the previous three years. This impact evaluation uses a mixed methods approach that includes quantitative analysis using data collected from ZELA cognitive assessments and pupil and school head questionnaires, and qualitative case studies in eight Zimbabwe schools.

[1] The textbooks and teaching and learning materials (exercise books, pens, pencils and teaching guides) were distributed as part of the ETF, and the text of this report primarily refers to the ETF acronym. A key research question of the ZELA program was to explore the extent to which test performance can be attributed to the ETF.

[2] ACER supported ZIMSEC in developing capacity in three specific topics in assessment between 2013-2015. These areas included: the analysis of relationships between student and school background characteristics and pupil performance using SPSS; practical training in Item Response Theory (IRT); and, research in Continuous Assessment (CA).

Background

After gaining independence in 1980 the Government of Zimbabwe expanded access to primary school education, which resulted in the number of primary school enrolments more than doubling in seven years. By 1982 primary enrolment rates were reported at almost 100 per cent (Nyanguru & Peil, 1991). The deterioration in Zimbabwe's economy since 2000 has had serious negative impacts on the delivery of education services (Government of Zimbabwe/United Nations, 2010, p. 48; Government of Zimbabwe, 2009). Data collected from the 2006 Education Management Information System (EMIS) and the 2009 Multiple Indicator Monitoring Survey (MIMS) indicated a decline in access to primary and secondary education, as well as a substantial rise in dropout rates between 2001 and 2008 (Government of Zimbabwe/United Nations, 2010, p. 48). UNICEF (2009) reported that between 2008 and 2009 school attendance fell from 80 per cent to 20 per cent. In addition, it was estimated that only about 40 per cent of the country's teachers were attending lessons (UNICEF, 2008).

In 2009 the sector slowly began to recover, with education being a priority in the new government's Short Term Emergency Recovery Programme (Government of Zimbabwe, 2009). After a dramatic decrease in primary school completion rates between 1996 (82.6 per cent) and 2006 (68.2 per cent), completion rates rose to 82.4 per cent in 2009 (UNICEF, 2012).

However, there are still significant concerns about the provision of quality education for primary school children in Zimbabwe. Demographic and Health Survey (DHS) statistics indicate that the nation's rural and poor citizens are substantially overrepresented in drop-out rates and repetition rates (UNICEF, 2008). 'O' level pass rates are still extremely low, and there remains limited access to important material and non-material resources that support teaching and learning (MOESAC, 2009).

In 2012, education data indicates that the system began to recover. The UNESCO Institute for Statistics reported a total net enrolment rate of 93.9 per cent in primary schools (with a gross enrolment rate of 109.2 per cent) (UNESCO, 2015). The UNICEF Multiple Indicator Cluster Survey (MICS) indicates that nine out of 10 children completed primary school in 2014 (UNICEF, 2014a, p. 4). While enrolment and teacher numbers have recovered from 2008-2009, there continues to be significant achievement lags in the education system (UNICEF, 2013, p. 8). Given the high variation in pupil achievement in rural and urban areas and funding for programs that support children with disabilities, there is need to focus on resolving systemic equity issues (UNICEF, 2014b).

After conducting four cycles of ZELA, socio-economic disparity is evident between high and low performing schools. Socio-economically advantaged pupils and schools tend to outscore their disadvantaged peers by larger margins than between any other groups of pupils in English and Mathematics. There are large differences in pupils' performance between provinces and between urban and rural areas.

Literature Review

This brief literature review presents findings from similar studies conducted in the southern African region. A rich source of comparative data has been produced by the Southern and Eastern Africa Consortium for Monitoring Education Quality (SACMEQ). SACMEQ is a cross-national research

program which involved 16 Ministries of Education in 2015. The consortium was established in 1995 and implemented its fourth data collection cycle in 2012-2014.[3] In addition, a range of related literature has informed this report with comparative findings on key variables such as gender, parents' education background, household resources, hours spent working for the family, pupil age, meals per day and other school inputs. Importantly, however, no single variable on its own can be causally linked to student learning outcomes.

In Southern Africa differences in gender performance are varied, with boys performing better in some school systems, and girls performing better in others (Saito, 2011). In Zimbabwe, trends appear to be following that of some other southern African nations where girls perform better than boys. However, Saito (2011) suggests that changes in boys and girls participation in education need to be continuously monitored.

In terms of teachers, Makuwa (2011) found the quality and professional certification of teachers varies widely throughout the southern African region depending on the historical context of each country. Makuwa (2011) also suggested that the link between the achievement level of teachers and the achievement level of students is highly variable and needs further investigation. Mukeredzi's (2013b) qualitative research on rural teachers in Zimbabwe and South Africa discusses the challenges of recruiting teachers in rural contexts because of geographical isolation, socio-economic conditions and cultural differences (p. 3). In addition to this, governments often adopt recruitment strategies such as in-service training or forcible assignment to rural schools that results in a high number of unqualified or underqualified teachers in rural schools (Mukeredzi, 2013b, p. 4). Shiza & Kawiro (2011) suggest teacher migration from Zimbabwe in 2008-2009 had a negative impact on the quality and organisation of education in the country. Their research suggests that teacher migration and attrition contribute to understaffing and employment of unqualified teachers (Shiza & Kawiro, 2011, p. 33). A point that consistently emerges in the literature is that of the complexity of the range of variables that may be related to student learning outcomes.

There is a well-established literature that explores the impact of family background on pupil learning outcomes. Parents' education background and household resources are two important indicators. Van der Berg & Louw (2006) used SAQMEQII data to explore factors that impacted pupil performance in the South African context. Better-educated parents may rank education as a high household priority, and may be able to provide more money, time and resources to their children's schooling. Van der Berg & Louw (2006) cite a study by Case & Deaton (1999) that found there were positive effects of students living in a household with a parent who had completed secondary education versus a parent who had completed primary education in the South African context.

Many parents or caregivers cannot send their children to school because of opportunity costs related to education, such as loss of children's labour to benefit the household.[4] Children and youth who

[3] Findings from the fourth cycle of SACMEQ have not been published. The latest publications available from SACMEQ are dated 2011.

[4] See for example UNESCO (2013/14). *Global Monitoring Report: Teaching and Learning*. Paris: UNESCO; UNESCO (2012). *Youth, Skills & Work*. Paris: UNESCO; UNICEF & UNESCO (2011). *The right to Education for All in Africa: Reinforcing Quality and Equity*. Paper prepared for the ECOSOC Annual Ministerial Review (AMR) Regional The OECD's Programme for International Student Assessment (PISA) defines equity in education as providing all students, regardless of gender, family background or socio-economic status, with similar opportunities to benefit from education (OECD,

contribute to family security through providing labour, or who take care of younger siblings or family members, may not be inclined to compromise the family's situation if attending school has limited or no value (UNICEF & UNESCO, 2011, p. 10). These issues are particularly acute in rural areas (UNESCO, 2012, p. 279).

Speaking the language of instruction outside school is reported as having a well-known association with improved student performance (Smith & Barrett, 2011, p. 3). Research indicates that students exposed to the language of instruction outside class 'rarely' had comparatively lower rates of academic performance than students exposed to the language of instruction 'sometimes' or 'often' (Smith & Barrett, 2011, p. 13).

The 2012 Monitoring Learning Achievement project (MLA) for Malawi found that the achievement levels of learners who had repeated at least one grade were significantly lower than those who had never repeated a grade. Smith & Barrett (2011) found that individual repetition and the peer effect of having larger numbers of repeaters in school has a greater impact in small Southern African states than large low income countries (p. 3). The effect of a student being over-age also has a significant negative relationship with student performance (Smith & Barrett, 2011; Zhang, 2006). While the relationship between age and performance on assessments is complex, Hungi et al (2014) found that in a number of countries in southern Africa younger students generally outperform their older peers.

The ability to concentrate and physical wellbeing facilitate children's learning potential. Smith & Barrett (2011) cite the SAQMEQII dataset that asked about number of meals eaten by a pupil per week, and found that children who consumed less than two meals per day were very strongly disadvantaged. Those students consuming less than two meals per day translated to a significantly lower performance in Botswana and Namibia (Smith & Barrett, 2011, p. 15).

Indeed, Van der Berg & Louw's (2006) analyses of the SAQMEQII dataset suggested that improved performance of students in wealthier schools is associated with a number of variables (p. 14). The authors suggest teacher absenteeism, principals' monitoring of student progress, and teacher quality are factors that determine student progress, and these factors interact with student socio-economic background in determining performance. Hungi (2011a) found that at the pupil level, socio-economic status, gender, age, grade repetition, and speaking the language of instruction at home were common contributors to variation in pupil achievement. School resources and school location were also identified as common predictors of achievement (Hungi, 2011b).

Spaull (2011) concludes in his analysis of the SACMEQIII data for South Africa that considering all of these variables has important implications for policy interventions that may improve the performance primary-school students, particularly those from poor and rural family backgrounds.

Majgaard and Mingat (2012) combined test scores from three international learning assessment programs—SACMEQ, PASEC and MLA surveys—to create a comparable Africa Student Learning Index (ASLI) for the region. Major findings at the school level on how learning outcomes can be improved included observable school characteristics such as the quality of school buildings and the

2013). For example, the stronger the impact of a student's socioeconomic status on his or her performance, the less equitable the school system. Equity, defined in this way, does not imply that everyone should have the same results, nor does it imply teaching the same material or providing the same resources to all students. Preparatory Meeting for Africa, Lome, Togo, 12 April 2011.

availability of libraries. The authors, however, acknowledge that pedagogy, and not only resources plays a role in student learning outcomes.

Murnane & Ganimian (2014) conducted a review of 115 impact evaluation studies in 33 low- and middle-income countries. The countries used a variety of strategies to improve the quality of education; and, interventions may have different effects for different groups targeted (Murnane & Ganimian, 2014). A study in Kenya, for example, found that low- and high-achieving students derived very different benefits from free English textbooks (Glewwe, Kremer & Moulin, 2009).

The above cited research indicates that there is a wide range of variables that may or may not contribute to pupil learning outcomes. No one factor is causal. The remainder of this chapter discusses the research questions, the study methodology, limitations of the study and an overview of the evaluation report.

Research Questions

The major research questions for the study are:

1. How do Zimbabwe pupils perform in the language and Mathematics tests? Is there a noticeable pattern of change over time?
2. What are the relationships of certain pupil, teaching and school variables with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe?
3. To what extent can improvement in test performance be attributed to the Education Transition Fund (ETF)?

Three hypotheses regarding the outcome of the intervention suggested by the analyses conducted in 2012 included:

1. An increase in average achievement over the time of the intervention
2. Smaller differences in performance between students subgroups according to their family background and
3. A reduction in disparity between schools.

The last two changes suggest more equitable opportunities to learn for all students.

Methodological Framework

The ZELA research design used both quantitative and qualitative methods. Four cycles of ZELA were conducted between 2012 and 2015. These cycles included tests in English, Mathematics, Shona and Ndebele administered to students in Term 1 of Grade 3 in a nationally representative sample of 500 schools each year. Eight schools across Zimbabwe were also selected as in-depth case studies. Qualitative research in schools was conducted in 2013 and 2014. Both quantitative and qualitative approaches are described in the following sections.

The overall framework for the ZELA study is an adaptation of the input–process–output (3P) model of learning and teaching developed by Biggs (1993). This model portrays learning as an interactive system that examines three points in time where learning takes place. These points include:

- the point before learning takes place (presage)
- the process of learning
- the outcome of learning.

The model for data in the pupil learning environment is represented diagrammatically in Figure 1.1.[5] The entries in the boxes are illustrative. The framework portrays learning as an interactive system, identifying three points of time at which learning-related factors are placed: presage, before learning takes place; process, during learning; and product, the outcome of learning (Biggs, 1993).

Biggs' model draws attention to two sets of presage factors: meta-contextual factors and those factors specific to the learner. In the adaptation of his model to datasets, the presage components are data about pupils, teachers, and school organisation and resourcing. The Biggs model provides a structure to analyse influences upon learning opportunities where the purpose is to promote collaborative working; and, as such, critical analysis of possibilities for better-targeted management of educational processes (Freeth & Reeves, 2004). This model is capable of generating predictions and associations that are relevant to this study and potential policy implications. Reading from top to bottom, from input through process to output, the diagram portrays the storyline for an individual pupil or pupil cohort.

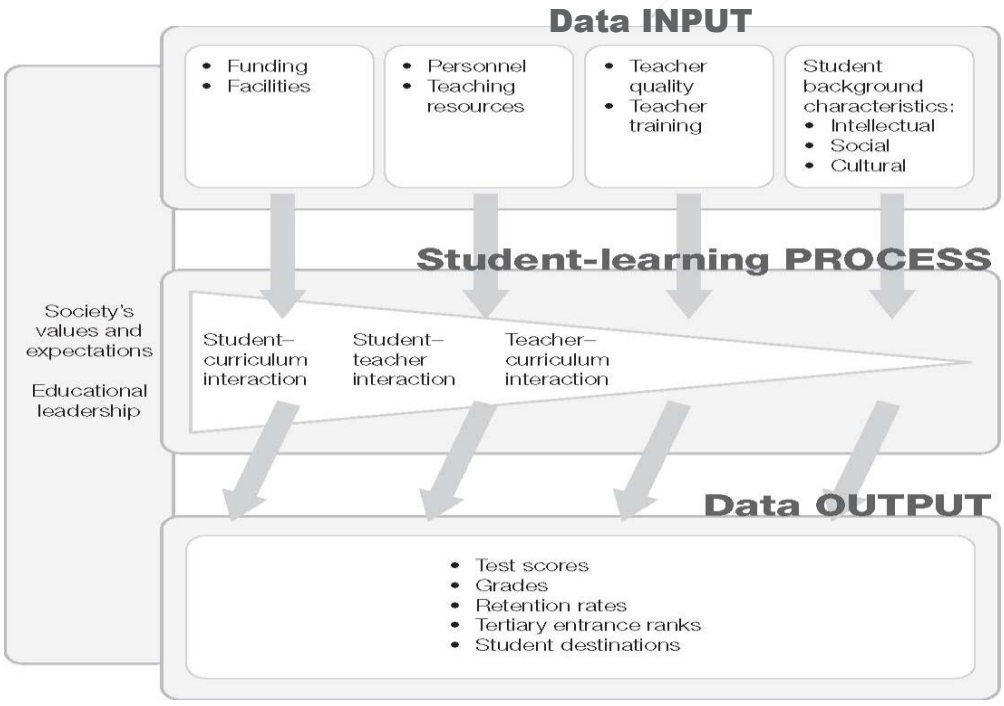


Figure 1.1: Input–process–output model for pupil data

Figure 1.1 provides an organisational framework to locate the data used in the ZELA research. The Background section of this report outlined the context of education in Zimbabwe. ZELA has gathered data about funding, facilities and resources, teacher quality and teacher training, and pupil

[5] Matters , G. N. (2006). *Using data to support learning in schools: students, teachers, systems* (Australian Education Review No. 49). Camberwell: ACER.

backgrounds. Table 1.1 lists the data that were gathered as *input* for the input-process-output model described in Figure 1.1. Table 2 lists the data *output* for ZELA.

Table 1.1 Datasets - Input for ZELA

Pupil level **(pupil background characteristics)**	**Teacher level** **(teacher quality and teacher training)**	**School level:** **Funding and facilities**
• Type of school attended • Age • Gender • Language spoken at home • No. of books in the home • Infrastructure accessed by the home (electricity and water) • No. of hours/day working for family/community • No. of meals eaten per day • No. of days absent in Term 1, 2012 • Access to resources to study in the home • Socioeconomic status (parental education level)	• No. of teachers • Qualifications of teachers • Gender • Teacher absentee rate	• Province • School type • District • Language of instruction in the early years • Years of operation • Proximity to a large city • Pupil population – enrolled • Grade 3 pupil population – enrolled • Average class size • Minutes per lesson • Sessions per day • No. of days of closure of school operations • School infrastructure • Wash facilities • Orphans and vulnerable children (%) • Funding • Pupils with chairs (%) • Textbook supply • Pupils in fee arrears (%)

Data outputs are pupil scores on tests of language (two subtests) and mathematics (two subtests). Table 1.2 provides an overview of these outputs.

Table 1.1 Datasets – Output for ZELA

Subtest score: Operations	Subtest score: Application	Subtest score: Language	Subtest score: Comprehension
Score for Mathematics		Score for Language	

Sample and Data Collection

A representative sample was drawn from the Zimbabwe Education Management Information System (EMIS) database provided by UNICEF. The sample yielded approximately 17,000 pupils in 500

schools across the 10 provinces of Zimbabwe.[6] The target population was pupils in Term 1 of Grade 3. The 2015 sample was drawn using the same sampling strata as the previous three years. This method provided sufficient statistical power to detect differences across a wide range of sub-groups. Compared to the population, some strata have a larger proportion in the sample compared to the province. This reflects the oversampling of smaller strata to ensure that sufficient data is collected from each province.

Students were sampled from registered and satellite schools. While Zimbabwe's land reform program has been implemented in phases since independence in 1980, there was a large increase in the number of satellite schools after the fast track phase of the land reform program in 2000 for children whose parents migrated to those areas (Mutema, 2014; Government of Zimbabwe, 2010). Satellite schools are constructed through community and government partnerships (Munjanganja & Machawira, 2014). Satellite schools were established rapidly in order to provide access to children whose families had moved to redistributed farms. Registered schools are formally recognised by government as meeting nationally approved standards. These standards were established by Zimbabwe's Ministry of Education and Culture in 1991 and remain as the key reference for school registration in 2015. A school can only become registered when it has established the following: "one administration block and toilets; a minimum of seven classrooms; a minimum of five teachers' houses; adequate toilet facilities as prescribed by official regulation; and, a source of clean, potable water" (Ministry of Education and Culture, 1991, p. 2). Satellite schools are formally attached to a registered school commonly referred to as a mother school. Satellite schools do not meet infrastructure and maintenance standards defined by MoPSE (Munjanganja & Machawira, 2014).

Data collection included both cognitive and questionnaire instruments. Four ZELA tests were administered in English, Mathematics, Ndebele and Shona over two days in 2012, 2013, 2014 and 2015. A single scale aligning the abilities of pupils with the difficulties of the items was constructed for each ZELA test (namely English, Ndebele, Shona and Mathematics) after thorough test-by-test analyses. For each scale (English, Ndebele, Shona and Mathematics), the distribution of pupil abilities in ZELA 2012 was transformed to a scale with a mean of 300 and a standard deviation of 25.[7] Link items from the 2012, 2013 and 2014 tests were used in the 2015 tests to ensure the 2012-2015 test results were comparable.[8]

ZELA used Item Response Theory (IRT) scaling methodology for creating proficiency scales for all subjects along which student performance was measured. The scales were divided into proficiency levels to report what students typically know and can do at each level. More technical details about the scaling process are included in the ZELA 2015 Technical Report. Some general background

[6] The sampling process is documented in the *ZELA 2015 Technical Report*.

[7] In 2012, the historical scale was determined to have a mean of 300 and standard deviation of 25. 300 is the metric used for the reporting scale to determine the percentage of students achieving at or above grade level. This is similar methodology as used in other international assessment programs such as PISA (Programme for International Student Assessment). The reporting scale enables comparability between years (or trend analysis).Test reliability and the psychometric analysis of the tests is documented in detail in the *ZELA 2015 Technical Report*.

[8] The calibration process is documented in *the ZELA 2015 Technical Report*.

information about IRT scaling methodology that is useful for interpreting the results of this report is presented in Box 1.1.

Box 1.1: Interpreting pupil achievement scores

Item response theory

Achievement cannot be directly observed or measured by a single question such as a person's height or gender. Instead, tests are used to measure such unobservable attributes and a measurement scale needs to be constructed. *Item response theory (IRT)* methodology is used to create such a scale. The responses of pupils to the test items are used to place both the pupils' achievements and the item difficulties on the same measurement scale. The English and Mathematics scales that were constructed for ZELA are presented in Figure 2.1 and Figure 2.2.

The yellow bars in the middle of the figures represent the scales and the units of measurement. In 2012, the mean performance in English and Mathematics was fixed to 300 and the standard deviation to 25. The horizontal bars on the left are frequencies of pupils at each location on this scale. Pupils at the top of the scale are high achievers; pupils at the bottom of the scale are low achievers. Items are placed on the same scale by their difficulty with difficult items at the top of the scale and easy items the bottom of the scale. Pupil achievement and item difficulty are matched on the scale in such a way that a pupil with the same achievement score as the difficulty of an item has 50 per cent chance of responding correctly to this item. Consequently, pupils with an achievement score higher than an item difficulty have more than 50 per cent chance of responding correctly and, similarly, pupils with an achievement score lower than the difficulty of an item have less than 50 per cent chance of responding correctly.

Placing items on the same scale as pupils enables describing the skills of pupils at each location on the scale and defining meaningful cut points such as below, at and above grade proficiency levels. Cut points between the proficiency levels are drawn in the Figure 2.1 and Figure 2.2 on the left of the yellow bar and descriptions of the skills that pupils are learning to master at each level are included on the right of the yellow bar. Figure 2.1 shows that in English 13 per cent of the Grade 3 population performed above grade level in 2015, 40 per cent at grade level and 47 per cent below grade level. The percentages for Mathematics were 18 per cent above grade level, 48 per cent at grade level and 34 per cent below grade level. The skills they are typically learning to master are described in the pictures.

A detailed description of the IRT methodology is beyond the scope of this research report. A good introduction to the subject is given in the book *Fundamentals of Item Response Theory* (Hambleton, Swaminatan and Rogers, 1991).

ZELA reports general results for the population of Grade 3 students, rather than results of individuals. The main statistics in this report include average performance of groups of Grade 3 pupils and percentages of pupils within grade levels (proficiency levels). Standard errors are used (and reported) to evaluate if differences between those averages or percentages are statistically significant. More information on interpreting statistical results included in this report is presented in Box 1.2. Technical details of the methodology and analysis of the data are included in the ZELA 2015 Technical Report (in preparation).

Box 1.2: Interpreting reported statistics

Statistical significance, standard errors and effect sizes

When reporting and interpreting results the notion of *statistical significance* is essential. All reported statistics are estimates for the full population of Grade 3 pupils in Zimbabwe. Not all, but only a selection of Grade 3 pupils was tested to provide these estimates. Testing all pupils would be too expensive and inefficient for the purpose of the survey. Basing population estimates on a sample of pupils causes an uncertainty in the estimates, because a different sample would have resulted in slightly different population estimates. Large samples that represent the population will result in smaller uncertainties than small samples..

In a similar way, it is not possible to assess pupils' achievement with test items that cover all possible skills within a domain. Only a representative set of items is used to test pupils' performance in English and Mathematics. If a different set of items had been chosen, pupils' performance would be slightly different, again leading to slightly different population estimates.

These two sources of uncertainty, the sampling of pupils and selection of items in a test, are expressed as *standard errors*. These standard errors are taken into account when mean performance or percentages at or above grade levels are compared across time or between groups of pupils. Differences in mean scores or percentages could be caused by real differences in the population or by chance due to the two sources of uncertainties. Standard errors tell us the likelihood that the differences are just caused by chance due to sampling of students and selection of test items. The usual acceptable level of uncertainty in reporting significant results that are actually just caused by chance is five per cent. If the likelihood is more than five per cent, it is concluded that the two means or percentages do *not* differ from each other. If the likelihood is less than five percent, it is concluded that the two means or percentages are (significantly) different from each other. Throughout the report, standard errors are included in the tables and presented between brackets.

In other words, even two values that look different from each other are regarded as not different if we are five per cent or more uncertain that this difference was caused by real differences in the population. Apparent differences are only interpreted as differences if they are statistically significant from each other; that is, if we are less than five per cent certain that the difference was caused by chance. Consider, for example, a hypothetical case where the average performance of girls is 324 and the average performance of boys is 322. While the mathematical difference is equal to 2 score points, it is in a statistical sense equal to zero (no difference) if we are more than five per cent certain that this difference was caused by chance. In this case the conclusion would be that there is *no difference* in performance between girls and boys. Only if we are less than five per cent certain of this it is concluded that girls perform better than boys. In summary,

a statistically significant difference = a difference

a statistically *non*-significant difference = *no* difference.

If differences are significant, the size of the difference can be described by dividing the difference by the standard deviation (25 score points). *Effect sizes* between 0.1 and 0.3 are labeled in this report as small, between 0.3 and 0.5 as moderate, greater than 0.5 as large and greater than 1 as very large.

This report is not aimed to provide a guide on statistics. Many books on basic statistics are available. A good book on the interpretation of statistics in social research is *Statistics without Maths for Psychology, 6th Edition* (Dancey & Reidy, 2014).

Nature of reported relationships

Most of the analyses conducted for this report involved comparisons of average achievement scores between groups of pupils, for example the difference in performance between pupils in urban and

rural areas. Whenever such a difference was statistically significant, it was concluded that the group variable was related to performance. However, this does not mean the relationship was necessarily causal. That is, living in urban areas does not necessarily help students learn. This is because the relationship could be explained by other variables that were not taken into account when doing the comparison. For example, it is possible that a difference in socio-economic status explained the difference in performance between urban and rural areas, or other student background or school characteristics. Hence, when describing these relationships, no direction of the effects was assumed.

The end of the report describes a multi-variate model which included several important pupil background and school characteristics. In such a model, the net effect is tested of each individual predictor while controlling for—or taking into account—differences in other predictors. If the predictors are carefully chosen, such a model allows for cautious interpretation of the direction of the effects; cautiously, because it is not possible to take all other (measured and unmeasured) factors into account. For example, it was found that pupils in schools that are further removed from the district centre performed on average less well than pupils in schools closer to the district centre. Of course, this effect is confounded with the effect of living in urban or rural areas and could also be explained by differences in family socio-economic status. Including all three variables in one model would show the net effect of each of the three variables, while taking differences in the other two variables into account. If the effect of the distance to the district centre is still significant after controlling for urban and rural locations and for socio-economic status, it can be concluded that additional factors, in excess of urban versus rural locations and family socio-economic status, negatively affect student performance in remote areas.

Questionnaires were distributed to pupils and to heads of schools (or their representatives) during the annual ZELA administration. Pupil questionnaires were designed to collect family background information while head of school questionnaires were designed to gather information on school context. Questionnaires were printed in English, but teachers were allowed to assist students in their local language and in filling out the questionnaire, if necessary.[9] Information guides were developed and dispatched to District Education Officers (DEOs), school heads, teachers and parents.

For the purpose of comparability. participation in a national research program requires standardisation of the assessment procedures across all schools. For this reason, a *Directions for Administration* manual was developed and used to train test administrators regarding the specific details of the two-day administration of all questionnaires and tests. In addition, Test Monitoring Officers (TMOs) were trained to observe the test administration process in a random selection of 30 schools. The TMOs submitted reports on their field observations.

Test administrators adhered to strict security protocols. Test and questionnaire responses were returned to ZIMSEC and the Ministry of Primary and Secondary Education (MOPSE) district and provincial offices. Both completed and non-completed instruments were couriered to a central location in Zimbabwe where test forms and questionnaires were manually entered into an electronic format for analysis. Data analysis and report writing was conducted by ZIMSEC and ACER.

Qualitative Case Studies

This evaluation report also includes the findings from the qualitative component of the Phase 2 monitoring cycles conducted in 2013 and 2014. Case studies were conducted in eight schools across

[9] The student questionnaires were designed by ZIMSEC and ACER. Test administrators advised teachers and parents that they could assist pupils in completing questionnaires if necessary.

Zimbabwe in 2013 and 2014. The case studies explored characteristics of high- and low-performing schools.

The case studies provided an insight into how stakeholders essentially interact with the social world of the school (Merriam, 1998). A premise of the qualitative case study research was to capture evidence of perceptions and experiences of stakeholders to provide a more holistic overview of education in Zimbabwe, particularly related to the factors that might affect student learning outcomes. The ZELA school case studies provided an opportunity to collect a range of stakeholder perceptions on the ETF, particularly the textbooks and resources procured under the ETF monitored through ZELA.

Six different groups of stakeholders were interviewed for each case study. These stakeholders included School Heads, Grade 3 teachers, Grade 3 pupils who took ZELA, parents of Grade 3 pupils, School Development Committee (SDC) representatives and District Education Officers (DEOs).

The following two research questions guided the ZELA case study component:

- What are stakeholder perceptions of the ETF?
- What contextual factors enable and/or constrain the ETF from meeting its goal of increasing access to quality education in Zimbabwe?

The implementation of the study over time

The progression of cohorts of pupils surveyed for ZELA is summarised in 3. The number in parenthesis refers to the order of the test cycles over the duration of the evaluation. This report addresses the 2015 cycle. 2015 is the fourth cycle of ZELA, and is the evaluation cycle after two monitoring cycles and the initial baseline study.

Table 1.3 Location of the 2015 cycle within the wider evaluation

2010	2012	2013	2014	2015
Grade 2 (1)	Grade 2 (2)	Grade 2 (3)		
EGLALN	Grade 3 1st cycle	Grade 3 2nd cycle	Grade 3 3rd cycle	Grade 3 4th cycle
NA	Baseline	Monitoring	Monitoring	Evaluation

Limitations of the study

In 2013, some improvements were made to the test items that were retained from 2012, particularly the lay-out and design. This improvement brought risks to the equating process. The tests were equated in order to compare the performance of pupils between 2012 and 2013. However, changes in the average mean abilities reported in the first monitoring cycle may have been in part attributable to changes in the position of link items and changes in the lay-out of the tests. The 2014 monitoring cycle and 2015 evaluation cycle built on the improvements developed in 2013.

As with the baseline study and the 2013 monitoring cycle, in 2014 and 2015 the Mathematics test was set in English and attempts were made to minimise the reading load on pupils. Nevertheless, it

can be expected that Mathematics is not the only construct being assessed, and that irrelevant constructs (such as reading comprehension and fluency in English) is also present in the Mathematics tests.

Pupils that were selected for the English and Mathematics assessments could choose to respond to the Shona or Ndebele language tests, but schools were not obliged to have students take the tests. The consequence of this self-selecting process is that the samples for the Shona and Ndebele languages were not comparable across the assessment years. Therefore, trends are not reported for achievement in Shona and Ndebele, but some results for 2015 are presented in Chapter 2.

The test administration for 2014 had very few challenges. Tests were administered on 12 and 13 March as outlined in the Implementation Plan for ZELA 2014. This was in contrast to the 2013 test, which was administered three weeks later in the school term due to unavoidable financial delays. This resulted in a slightly higher rate of pupils attending only one of the two days of test administration due to absenteeism in the last week of the school term.

Overview of the Report

This chapter introduced the evaluation of the Education Development Fund Program, including a description and background of the study, major research questions, the methodological framework, a review of key literature, and the limitations of the study.

Chapter 2 addresses the first research question: *How do the Zimbabwe pupils perform in the language and Mathematics tests and is there a noticeable change in performance over time?* The chapter provides a picture of achievement in Zimbabwe at the national level and by sub-groups including gender, location, province, school type and age. It describes the changes observed in pupil performance since the baseline. Chapter 2 also includes the descriptive statistics of the ZELA population in 2012 and 2015 and analyses on relationships between performance and demographic groups and family background variables.

Chapter 3 explores how Zimbabwe is providing education opportunities and achieving educational outcomes, which are an indication of equity in society as a whole. Tracking the evolution of socio-economic disparities over time can help the Zimbabwe school system monitor whether and how inequities in education opportunities and outcomes are growing or shrinking.

Chapters 4 and 5 further explore the question: *What are the relationships of school context variables with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe?* Chapter 4 is a qualitative exploration of the characteristics of low and high performing schools from the perspective of six different stakeholder groups: teachers, school heads, parents, DEOs, SDC members and pupils. These findings emerged from in-depth interviews and consultations at eight schools throughout Zimbabwe. The findings provide a snapshot of a range of educational contexts in Zimbabwe from the perspectives of people who engage with their schools, school communities and districts on a daily basis.

Chapter 5 reports on performance on the tests of language and Mathematics within the learning context, with teacher and teaching resources and school resources (funding and facilities) as specific to the educational context. The Chapter explores the interaction of a range of variables that are associated with pupil performance in English and Mathematics in the Zimbabwe educational context.

Chapter 6 is a review of ZELA's major findings over the four-year period of 2012-2015. It addresses the final major research question: *To what extent has the EDF had an effect on pupil performance?* It summarizes implications for policy based on the evidence emerging from the research. As this report is an impact evaluation, Chapter 6 also addresses lessons learned throughout the life of ZELA, and considers future directions and programming for the monitoring of pupil achievement in Zimbabwe.

Chapter 2 – Performance in Language and Mathematics overall and by pupil demographics and family background variables

This chapter describes trends in performance of Grade 3 pupils in English and Mathematics from 2012 to 2015. Pupils that were selected for the English and Mathematics assessments could choose to respond to one of the African languages tests, but were not obliged to. The consequence of this self-selecting process is that the samples for the African languages were not comparable across the assessment years. Therefore, trends are not reported for achievement in Shona and Ndebele, but some results for 2015 are presented at the end of this chapter.

In total 17,335 pupils were assessed from 493 schools. Nationwide, the response rate was 92 per cent (99 per cent for schools and 93 per cent for students within schools). The response rates were somewhat higher in registered schools than in satellite schools (93 and 90 per cent, respectively). They were similar in urban and rural areas (93 and 92 per cent, respectively). The response rates were highest in Mashonaland West (96 per cent) and lowest in Matabeleland North (84 per cent). A response rate of 80 per cent or higher is generally regarded as acceptable in large international surveys from the Organisation for Economic Co-operation and Development and the International Association for the Evaluation of Educational Achievement. More details on the computation of response rates are included in the ZELA 2015 Technical Report.

Results in this chapter are reported overall and by pupil demographic and family background variables. Population descriptives based on the full samples from 2012 and 2015 are included in Table 2.1. The table shows that most distributions of background variables have remained stable since 2012, but that there seems to be a small increase in home possessions, home educational resources and parental education.

Table 2.1: Population descriptives in 2012 and 2015

	2012		2015	
	%	Valid %	%	Valid %
Gender				
Boy	50	50	48	50
Girl	50	50	48	50
Missing	*0*		*4*	
Location				
Urban	20	20	22	22
Rural	79	80	78	78
Missing	*1*		*0*	

	2012		2015	
	%	Valid %	%	Valid %
Province				
Bulawayo	4	4	4	4
Harare	9	9	10	10
Manicaland	15	15	16	16
Mashonaland Central	10	10	10	10
Mashonaland East	11	11	11	11
Mashonaland West	12	12	11	11
Masvingo	13	13	14	14
Matabeleland North	7	7	7	7
Matabeleland South	6	6	5	5
Midlands	13	13	13	13
Missing	*0*		*0*	
Age (in years)				
6 or younger	1	1	2	2
7	13	13	13	13
8	38	39	36	37
9	27	28	26	27
10	12	12	12	12
11	5	5	4	4
12	2	2	2	2
13	0	0	1	2
14 or older	0	0	1	1
Missing	*1*		*2*	
Language at home				
Shona	67	67	69	73
Ndebele	14	14	14	14
English	2	2	4	4
Other	17	17	9	9
Missing	*0*		*5*	
Time spent working for family				
Less than 1 hour a day	29	33	30	33
1 or more but less than 2 hours a day	23	26	25	27
2 or more but less than 3 hours a day	17	19	18	19
3 hours or more a day	19	21	19	20
Missing	*12*		*8*	
Meals per day				
1 meal	10	11	10	10
2 meals	28	31	30	33
3 or more meals	52	58	53	57
Missing	*11*		*7*	

	2012		2015	
	%	Valid %	%	Valid %
Number of home possessions				
Zero	11	12	3	3
One	26	29	34	35
Two	21	23	23	24
Three	17	18	19	20
Four	16	18	16	17
Missing	*10*		*5*	
Number of home educational resources				
Zero	3	3	1	1
One	39	43	38	38
Two	23	26	22	22
Three	14	15	16	16
Four to six	12	13	20	20
Missing	*10*		*4*	
Highest parental education				
Did not go to school	3	3	3	3
Started some grades of primary school	5	6	5	5
Completed primary school	9	10	9	11
Started some grades of secondary school	18	21	14	16
Completed secondary school	43	50	38	44
Started some tertiary study	1	2	5	6
Completed a tertiary course	7	8	13	15
Missing	*15*		*13*	

Overall results in English and Mathematics since 2012

The main focus of this report is to describe how performance in 2015 compares to performance in the previous three years. As described in Box 1.1, the figures below show the described scales for English and Mathematics performance with the distribution of students depicted by the bars on the left of the scale. Figure 2.1 shows that in English 13 per cent of the Grade 3 population performed above grade level in 2015, 40 per cent at grade level and 47 per cent below grade level. The percentages for Mathematics were 18 per cent above grade level, 48 per cent at grade level and 34 per cent below grade level.

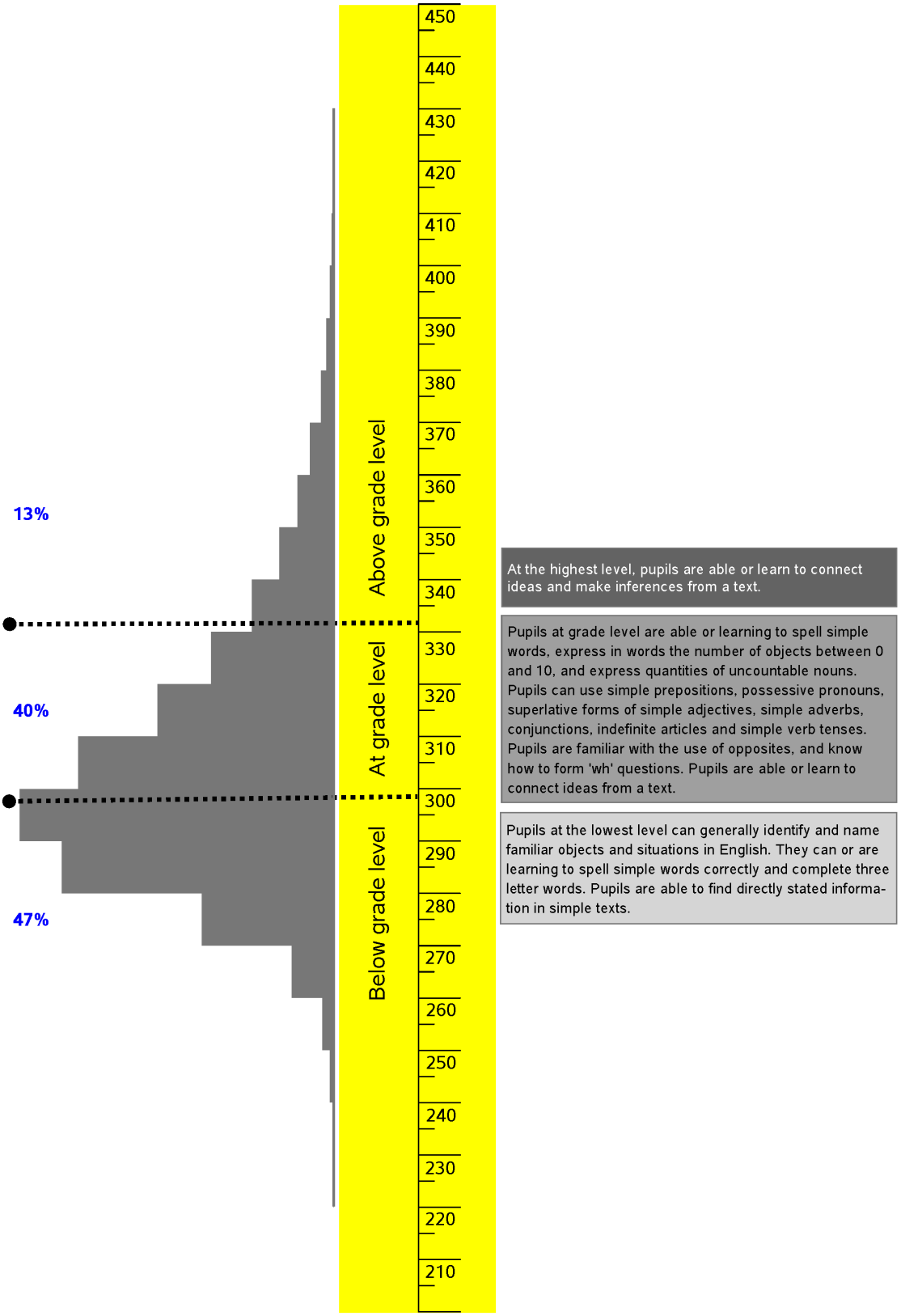


Figure 2.1: The ZELA described scale for English performance

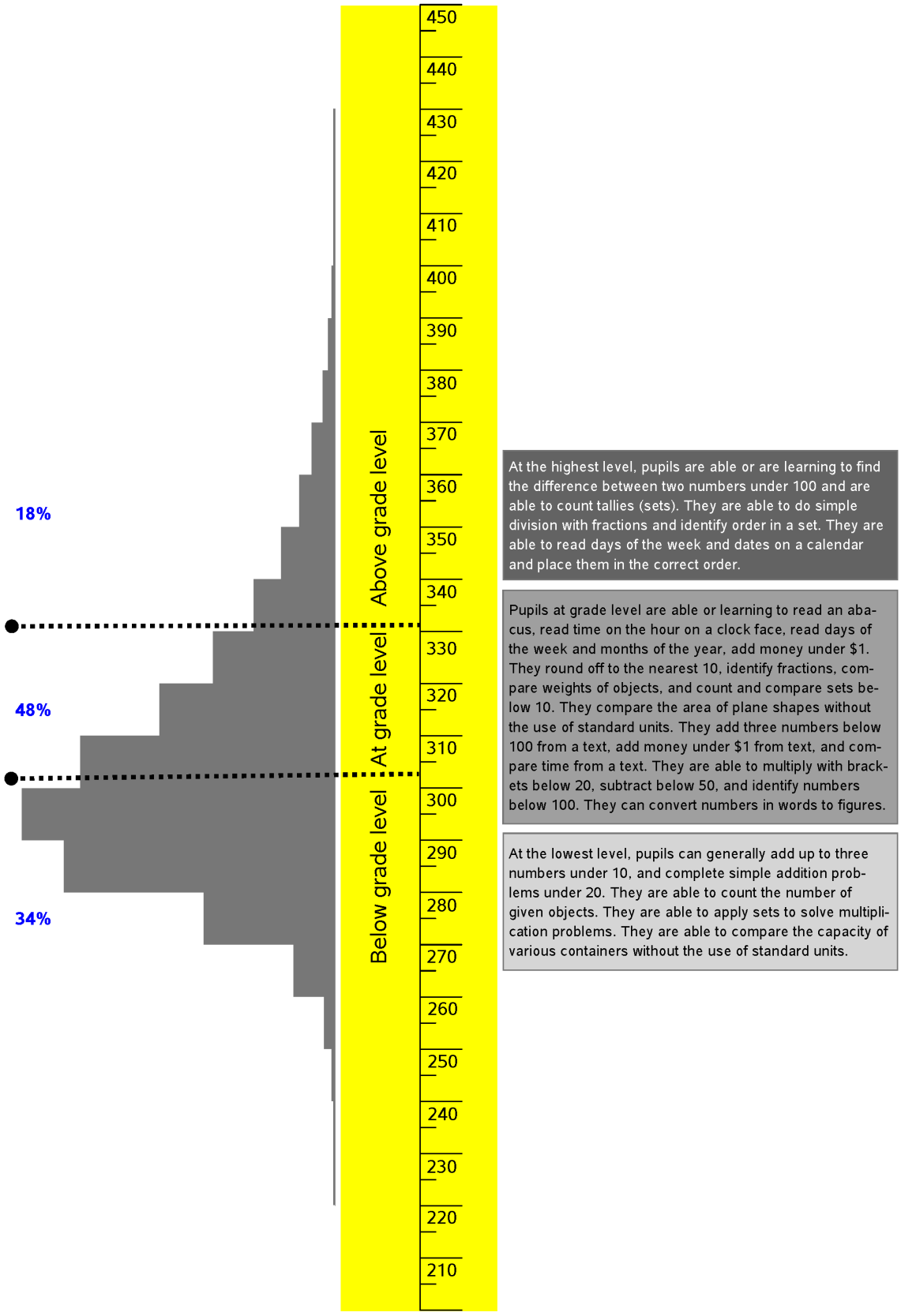


Figure 2.2: The ZELA described scale for Mathematics performance

Table 2.2 shows that the overall mean performance in English and Mathematics of Grade 3 pupils in Zimbabwe increased significantly between 2012 and 2013 and that the mean performance did not change after 2013. The last column of the table shows that the average performance in both domains was significantly higher in 2015 than in 2012. The increase was small for English and moderate for Mathematics. The change in average performance in English and Mathematics from 2012 to 2015 is graphically presented in Figure 2.3.

Table 2.2: Overall performance in English and Mathematics since 2012

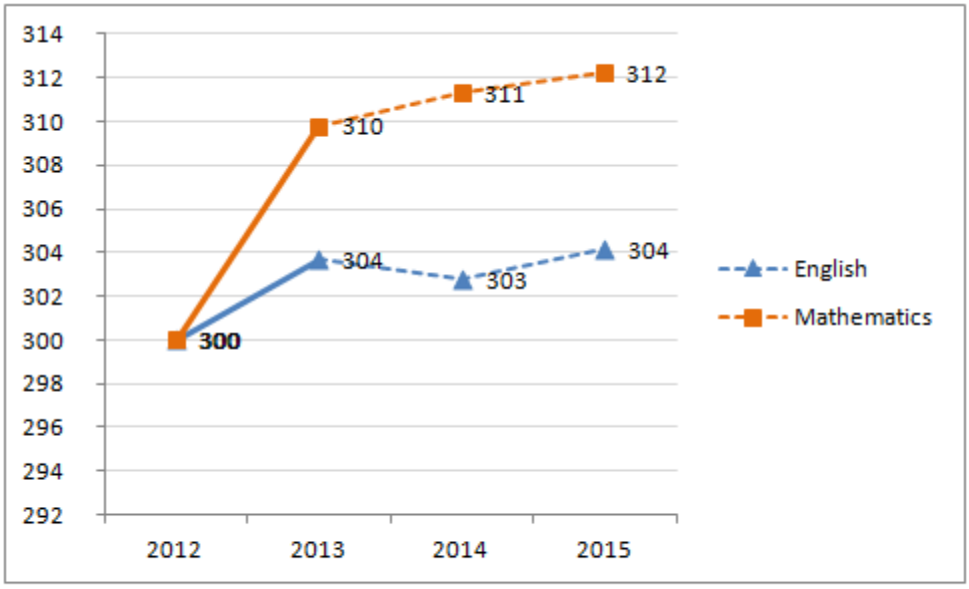
English	2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Mean performar	300.0 (1.00)	▲	303.7 (0.97)	⇹	302.8 (0.91)	⇹	304.2 (0.78)	▲
At or above the	49 (1.4)	⇹	54 (1.6)	⇹	51 (1.4)	⇹	53 (1.4)	⇹
Mathematics	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Mean performar	300.0 (0.97)	▲	309.8 (0.77)	⇹	311.3 (0.62)	⇹	312.2 (0.59)	▲
At or above the	46 (1.5)	▲	63 (1.3)	⇹	67 (1.0)	⇹	66 (1.1)	▲

Standard errors are reported between brackets

▲ *for postive trend*

⇹ *for no change*

▼ *for negative trend*



Broken line for no change

Solid line for significant change

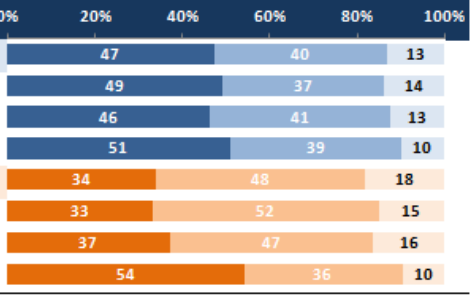
Figure 2.3: Mean performance in English and Mathematics since 2012

As for the percentages of pupils performing at or above grade level, a significant increase between 2012 and 2015 was recorded for Mathematics, but not for English (see Table 2.2). In 2012, 46 per cent of the Grade 3 pupils performed at or above grade level in Mathematics and in 2015, 66 per cent performed at or above grade level, an increase of 20 percentage points.

Table 2.3 shows the percentage of pupils in each proficiency level from 2012 to 2015 for English and Mathematics. While the change in these percentages cannot be tested for statistical significance for technical reasons, it appears that the percentage of pupils in both the middle and top proficiency levels has increased over this period of time.

Table 2.3: Percentages below, at and above grade level in English and Mathematics since 2012

		Below grade level (%)	At grade level (%)	Above grade level (%)
English	2015	47 (1.4)	40 (1.1)	13 (1.1)
	2014	49 (1.4)	37 (0.9)	14 (0.9)
	2013	46 (1.6)	41 (1.3)	13 (1.2)
	2012	51 (1.4)	39 (1.0)	10 (1.1)
Mathematics	2015	34 (1.1)	48 (1.1)	18 (1.0)
	2014	33 (1.0)	52 (0.7)	15 (0.9)
	2013	37 (1.3)	47 (1.0)	16 (1.1)
	2012	54 (1.5)	36 (0.9)	10 (1.0)



Differences in English and Mathematics by subgroups of demographic and family background

Results in English and Mathematics are presented by the following demographic and family background variables: gender, location, province, age group, language spoken at home, time spent working for the family per day, number of meals per day, number of home possessions, number of home educational resources and highest parental education. Performance is presented as mean scale scores and as percentages at or above grade level.

Gender

Since 2012, girls have performed better than boys in English and Mathematics (see Table 2.4). The difference in mean performance was small, although somewhat larger in English than in Mathematics, and stable across time. As a result, both boys and girls significantly improved in English and Mathematics performance between 2012 and 2013 and remained at the same level after 2013. The difference between 2012 and 2015 in English achievement was significant for girls but not for boys, and in Mathematics performance significant for both boys and girls.

The percentages of male and female pupils at or above grade level in English performance did not increase between 2012 and 2015, but increased significantly in Mathematics performance (by about 20 per cent).

Table 2.4: Performance in English and Mathematics by gender since 2012

Mean performance		**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
English	Boys	297.5 (0.95)	▲	302.0 (1.12)	⇹	300.4 (0.98)	⇹	301.4 (0.76)	⇹
	Girls	302.6 (1.12)	▲	306.6 (1.03)	⇹	306.4 (1.02)	⇹	307.1 (0.91)	▲
	Difference (G-B)	▲		▲		▲		▲	
Mathematics	Boys	298.3 (0.97)	▲	308.5 (0.90)	⇹	310.1 (0.73)	⇹	310.8 (0.58)	▲
	Girls	301.8 (1.03)	▲	311.8 (0.82)	⇹	313.4 (0.62)	⇹	314.2 (0.70)	▲
	Difference (G-B)	▲		▲		▲		▲	
Percentage at or above grade level		**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
English	Boys	45 (1.5)	⇹	51 (1.9)	⇹	47 (1.5)	⇹	47 (1.5)	⇹
	Girls	54 (1.6)	⇹	59 (1.7)	⇹	56 (1.6)	⇹	57 (1.6)	⇹
Mathematics	Boys	43 (1.5)	▲	60 (1.6)	⇹	65 (1.3)	⇹	64 (1.2)	▲
	Girls	49 (1.7)	▲	67 (1.5)	⇹	70 (1.1)	⇹	69 (1.4)	▲

Standard errors are reported between brackets

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

School location

Pupils in urban areas outperformed pupils in rural areas in both subjects and in all assessment years (see Table 2.5). The difference in mean performance was large, especially in English. In addition, the difference in mean English performance between urban and rural areas grew larger over time, because the pupils in rural areas did not improve between 2012 and 2013 like the pupils in urban areas. This interaction effect is shown in Figure 2.4.

Consistent with the reported trends in mean English performance, the percentage of pupils at or above grade level increased significantly in urban areas from 69 to 82 per cent, but not in rural areas. For Mathematics performance, this percentage increased significantly in both urban and rural areas by about 20 percentage points. In urban areas the percentages were 63 in 2012 and 84 in 2015; in rural areas they were 41 and 61, respectively.

Table 2.5: Performance in English and Mathematics by school location since 2012

Mean performance		**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
English	Urban	313.5 (2.77)	▲	324.6 (2.65)	⇹	328.6 (1.77)	⇹	324.4 (1.83)	▲
	Rural	296.4 (1.04)	⇹	297.2 (0.72)	⇹	296.2 (0.93)	⇹	298.5 (0.85)	⇹
	Difference (R-U)	▼		▼		▼		▼	
Mathematics	Urban	311.2 (2.14)	▲	323.0 (1.65)	⇹	325.8 (0.99)	⇹	325.5 (1.36)	▲
	Rural	297.1 (1.08)	▲	305.7 (0.73)	⇹	307.6 (0.66)	⇹	308.5 (0.63)	▲
	Difference (R-U)	▼		▼		▼		▼	
Percentage at or above grade level		**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
English	Urban	69 (2.9)	▲	84 (2.6)	⇹	86 (1.5)	⇹	82 (1.8)	▲
	Rural	44 (1.6)	⇹	44 (1.7)	⇹	42 (1.6)	⇹	44 (1.6)	⇹
Mathematics	Urban	63 (3.1)	▲	82 (2.3)	⇹	87 (1.1)	⇹	84 (2.0)	▲
	Rural	41 (1.7)	▲	57 (1.4)	⇹	61 (1.2)	⇹	61 (1.3)	▲

Standard errors are reported between brackets

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

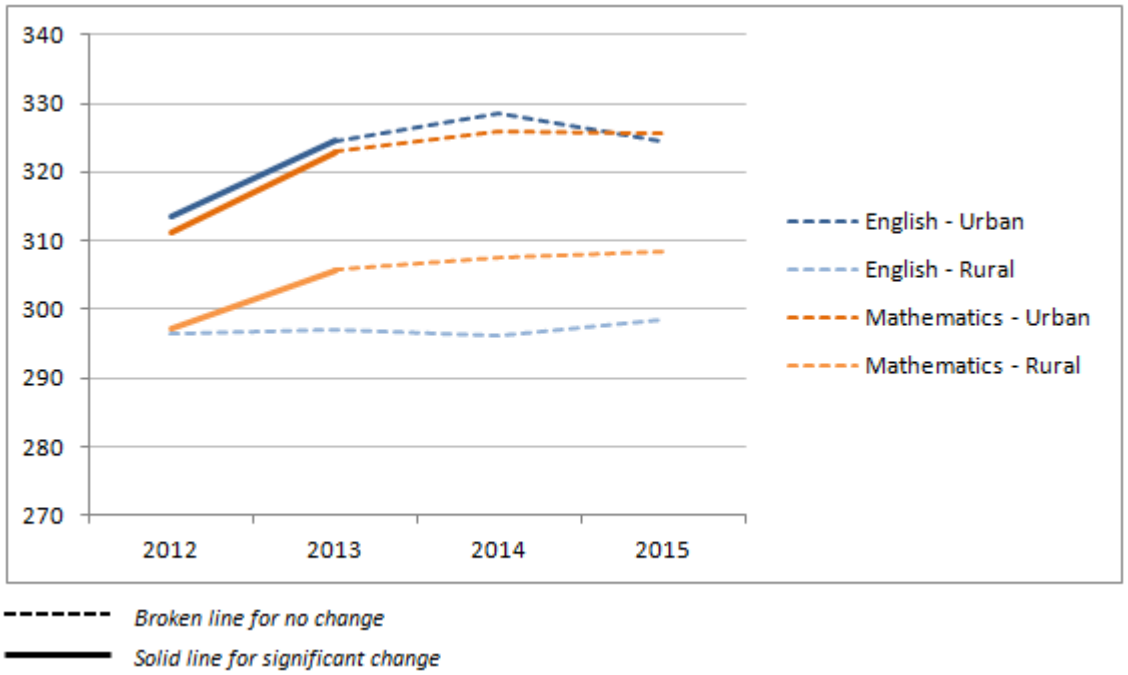


Figure 2.4: Mean performance in English and Mathematics by school location since 2012

Province

Mean performance and percentages at or above grade level were computed for each of the 10 provinces. The statistics were compared over time and provinces were compared with each other. It needs to be noted that the uncertainty in the estimates is larger for smaller groups, which decreases the statistical power. This means that differences need to be quite large to be statistically significant, which explains why the positive trend between 2012 and 2013 was not confirmed in most of the provinces, especially in English performance.

Table 2.6 shows that in English only Manicaland improved significantly between 2012 and 2013 in both mean performance and percentage at or above grade level. Between 2013 and 2014, Mashonaland Central improved the percentage of pupils at or above grade level. None of the provinces changed in performance between 2014 and 2015. When comparing 2012 and 2015, a moderate increase in mean performance was observed in Bulawayo and a small increase in Mashonaland East.

When comparing mean performance in English between provinces in 2015, Harare and Bulawayo outperformed all other provinces. Mashonaland East performed better than Mashonaland Central, Midlands and Matabeleland North. Both Manicaland and Masvingo showed higher achievement than Midlands and Matabeleland North. Pupils in Matabeleland South performed better than pupils in Matabeleland North.

Table 2.6: Mean performance in English by province since 2012

English		2012		2013		2014		2015		2012-2015
Bulawayo	Mean performance	316.0	(2.66)	319.7	(3.31)	327.2	(3.81)	324.7	(2.25)	▲
	At or above the benchmark (%)	76	(3.4)	84	(3.8)	84	(2.9)	84	(3.3)	↔
Harare	Mean performance	321.1	(5.24)	323.4	(4.83)	331.0	(2.10)	325.8	(1.97)	↔
	At or above the benchmark (%)	76	(4.6)	82	(4.2)	89	(2.0)	86	(1.9)	↔
Manicaland	Mean performance	297.5	(1.23)	305.7	(3.14)	304.3	(3.53)	302.9	(2.46)	↔
	At or above the benchmark (%)	46	(2.8)	57	(4.7)	52	(4.0)	52	(3.9)	↔
Mashonaland Central	Mean performance	295.5	(1.31)	294.2	(2.65)	300.5	(2.18)	297.3	(1.60)	↔
	At or above the benchmark (%)	43	(2.8)	35	(5.4)	50	(4.2)	42	(3.5)	↔
Mashonaland East	Mean performance	296.9	(2.27)	301.8	(2.82)	303.3	(2.55)	303.8	(1.88)	▲
	At or above the benchmark (%)	47	(4.1)	53	(4.8)	52	(3.6)	54	(4.5)	↔
Mashonaland West	Mean performance	299.1	(3.52)	299.8	(2.51)	294.1	(1.49)	300.8	(3.60)	↔
	At or above the benchmark (%)	46	(5.0)	47	(4.6)	39	(4.5)	47	(6.3)	↔
Masvingo	Mean performance	299.3	(1.03)	304.4	(2.59)	298.1	(2.90)	302.9	(2.57)	↔
	At or above the benchmark (%)	51	(2.3)	58	(4.8)	46	(5.7)	52	(4.0)	↔
Matabeleland North	Mean performance	290.6	(2.35)	292.6	(3.05)	292.0	(1.80)	295.1	(2.58)	↔
	At or above the benchmark (%)	34	(3.7)	34	(5.6)	35	(2.9)	34	(2.8)	↔
Matabeleland South	Mean performance	294.0	(5.66)	299.2	(4.08)	295.5	(2.04)	300.5	(1.70)	↔
	At or above the benchmark (%)	40	(9.9)	43	(5.6)	41	(3.8)	48	(2.4)	↔
Midlands	Mean performance	297.1	(4.05)	301.8	(1.21)	297.3	(3.03)	300.0	(1.76)	↔
	At or above the benchmark (%)	44	(5.7)	50	(2.8)	41	(3.8)	44	(3.4)	↔

Standard errors are reported between brackets

▲ *for postive trend*

↔ *for no change*

▼ *for negative trend*

Table 2.7 shows that all but one province, Mashonaland West, increased in performance on the Mathematics test over the full length of the project from 2012 and 2015. A positive trend was recorded for six out of 10 provinces (Manicaland, Mashonaland Central, Mashonaland East, Masvingo, Matabeleland South and Midlands). Just as in English performance, Mashonaland Central showed an increase in performance between 2013 and 2014. None of the provinces changed in performance after 2014.

Similar to the results in English achievement, Harare and Bulawayo performed better in Mathematics than all the other provinces in 2015. Mashonaland East scored higher than Mashonaland Central, Midlands and Matabeleland North. Manicaland and Masvingo outperformed Midlands and Matabeleland North. Finally, Matabeleland South pupils performed better on the Mathematics test than Matabeleland North pupils.

Table 2.7: Mean performance in Mathematics by province since 2012

Mathematics		2012		2013		2014		2015		2012-2015
Bulawayo	Mean performance	314.8	(1.69)	319.9	(2.96)	325.4	(2.25)	325.6	(1.80)	▲
	At or above the benchmark (%)	71	(2.7)	81	(5.5)	86	(2.0)	85	(2.5)	▲
Harare	Mean performance	316.8	(4.01)	322.4	(2.90)	326.5	(1.09)	328.5	(1.52)	▲
	At or above the benchmark (%)	71	(5.7)	81	(4.0)	88	(1.7)	88	(1.9)	▲
Manicaland	Mean performance	297.4	(1.24)	311.0	(2.12)	311.9	(2.52)	311.9	(1.79)	▲
	At or above the benchmark (%)	42	(2.2)	67	(3.9)	67	(3.4)	68	(3.3)	▲
Mashonaland Central	Mean performance	296.4	(1.13)	302.2	(2.19)	310.0	(2.08)	307.8	(1.62)	▲
	At or above the benchmark (%)	41	(2.4)	48	(3.9)	66	(4.2)	58	(3.4)	▲
Mashonaland East	Mean performance	298.3	(2.42)	308.3	(1.81)	312.0	(1.54)	313.2	(1.66)	▲
	At or above the benchmark (%)	44	(4.3)	60	(3.9)	68	(2.8)	69	(3.7)	▲
Mashonaland West	Mean performance	300.9	(4.25)	306.9	(2.22)	309.0	(0.99)	309.2	(2.85)	↔
	At or above the benchmark (%)	46	(6.1)	58	(4.2)	67	(2.5)	60	(5.8)	↔
Masvingo	Mean performance	300.1	(1.45)	312.0	(2.26)	308.0	(1.88)	311.8	(1.58)	▲
	At or above the benchmark (%)	46	(2.6)	68	(3.9)	62	(3.2)	67	(2.7)	▲
Matabeleland North	Mean performance	290.6	(2.71)	298.5	(3.35)	303.5	(1.63)	305.1	(1.90)	▲
	At or above the benchmark (%)	31	(3.3)	43	(6.5)	50	(3.4)	52	(2.5)	▲
Matabeleland South	Mean performance	294.0	(4.78)	308.1	(4.29)	306.4	(1.51)	310.4	(1.39)	▲
	At or above the benchmark (%)	37	(8.4)	58	(6.3)	58	(3.6)	64	(2.8)	▲
Midlands	Mean performance	296.5	(3.74)	310.4	(1.05)	308.0	(1.86)	307.3	(1.31)	▲
	At or above the benchmark (%)	40	(5.4)	65	(1.9)	62	(3.2)	58	(2.4)	▲

Standard errors are reported between brackets

▲ *for postive trend*

↔ *for no change*

▼ *for negative trend*

Age group

Similar to the analyses by province, mean performance was computed for pupils' age groups and compared over time and between age groups (see Table 2.8). While an initial improvement in English performance was recorded between 2012 and 2013 for eight, nine and 10 year old pupils, none of these improvements were maintained in the next two years. Ten year old pupils showed a drop in performance between 2013 and 2014. The results indicate that there was no interaction effect between changes in English performance over time and age group.

When comparing the age groups with each other as shown in Table 2.9, the seven year old pupils performed best in English. This is possibly due to strong family support in the pupil's educational career. Starting school at such an early age in Zimbabwe is often associated with less home duties and more time to learn as well as variables such as family wealth, language spoken at home and school location.. Eight year old pupils perform less well than seven year old pupils, but better than all other age groups. Next are the nine year olds, who performed better than the ten and eleven year olds.

Table 2.8: Mean performance in English by age group since 2012

English	2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Age 6 or below	298.2 (3.08)	⇹	306.0 (3.31)	⇹	302.9 (2.43)	⇹	299.2 (1.73)	⇹
Age 7	305.7 (1.90)	⇹	310.8 (1.89)	⇹	307.2 (1.41)	⇹	311.3 (1.89)	⇹
Age 8	303.0 (1.32)	▲	309.2 (1.28)	⇹	307.9 (1.21)	⇹	307.6 (1.03)	⇹
Age 9	296.7 (0.92)	▲	301.9 (0.83)	⇹	299.5 (1.01)	⇹	300.0 (0.85)	⇹
Age 10	294.7 (1.00)	▲	300.1 (1.17)	▼	296.5 (1.05)	⇹	298.5 (0.86)	⇹
Age 11	295.3 (1.03)	⇹	298.7 (1.35)	⇹	297.3 (1.58)	⇹	297.1 (1.00)	⇹
Age 12	293.9 (1.52)	⇹	296.9 (2.26)	⇹	298.3 (1.52)	⇹	298.1 (1.57)	⇹
Age 13	292.7 (3.68)	⇹	298.8 (5.02)	⇹	295.3 (3.09)	⇹	299.0 (1.65)	⇹
Age 14 or above	298.7 (1.90)	⇹	299.8 (6.52)	⇹	301.0 (5.36)	⇹	299.6 (3.65)	⇹

Standard errors are reported between brackets

▲ *for postive trend*

⇹ *for no change*

▼ *for negative trend*

Table 2.9: Pair wise comparisons between age groups in English performance in 2015

		Age 6 or below	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14 or above
Age 6 or below	299.2 (1.73)		▼	▼	·	·	·	·	·	·
Age 7	311.3 (1.89)	▲		▲	▲	▲	▲	▲	▲	▲
Age 8	307.6 (1.03)	▲	▼		▲	▲	▲	▲	▲	▲
Age 9	300.0 (0.85)	·	▼	▼		▲	▲	·	·	·
Age 10	298.5 (0.86)	·	▼	▼	▼		·	·	·	·
Age 11	297.1 (1.00)	·	▼	▼	▼	·		·	·	·
Age 12	298.1 (1.57)	·	▼	▼	·	·	·		·	·
Age 13	299.0 (1.65)	·	▼	▼	·	·	·	·		·
Age 14 or above	299.6 (3.65)	·	▼	▼	·	·	·	·	·	

▲ *Age group on the left higher than age group at the top*

▼ *Age group on the left lower than age group at the top*

· *No difference between the two age groups*

All age groups up to 12 years old increased significantly in performance between 2012 and 2013 (see Table 2.10). These gains in achievement remained until 2015 and the high achieving seven year olds gained further improvement between 2014 and 2015. The 13 year olds did not show short term improvement, but the cumulative increase from 2012 to 2015 was significant.

As for Mathematics achievement, the seven year olds were the highest achievers, closely followed by the eight year olds (see Table 2.11). The other age groups did not differ from each other in Mathematics performance.

Table 2.10: Mean performance in Mathematics by age group since 2012

Mathematics	2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Age 6 or below	295.8 (3.22)	▲	312.5 (2.61)	◆▶	308.6 (2.05)	◆▶	308.6 (1.30)	▲
Age 7	303.5 (1.49)	▲	314.0 (1.30)	◆▶	313.4 (0.88)	▲	316.9 (1.12)	▲
Age 8	302.2 (1.23)	▲	313.9 (1.03)	◆▶	314.6 (0.84)	◆▶	314.4 (0.75)	▲
Age 9	297.7 (1.01)	▲	309.2 (0.80)	◆▶	309.5 (0.68)	◆▶	309.7 (0.71)	▲
Age 10	296.0 (1.07)	▲	308.1 (0.95)	◆▶	307.5 (0.83)	◆▶	308.3 (0.84)	▲
Age 11	297.2 (1.19)	▲	306.9 (1.39)	◆▶	308.5 (1.24)	◆▶	308.1 (0.89)	▲
Age 12	297.0 (1.73)	▲	308.9 (2.20)	◆▶	308.1 (1.66)	◆▶	309.3 (1.47)	▲
Age 13	297.0 (4.02)	◆▶	308.2 (4.82)	◆▶	306.2 (2.54)	◆▶	309.1 (1.55)	▲
Age 14 or above	304.6 (2.26)	◆▶	315.8 (5.13)	◆▶	308.5 (3.96)	◆▶	311.6 (4.70)	◆▶

Standard errors are reported between brackets

▲ *for postive trend*

◆▶ *for no change*

▼ *for negative trend*

Table 2.11: Pair wise comparisons between age groups in Mathematics performance in 2015

		Age 6 or below	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14 or above
Age 6 or below	308.6 (1.30)	·	▼	▼	·	·	·	·	·	·
Age 7	316.9 (1.12)	▲	·	▲	▲	▲	▲	▲	▲	·
Age 8	314.4 (0.75)	▲	▼	·	▲	▲	▲	▲	▲	·
Age 9	309.7 (0.71)	·	▼	▼	·	·	·	·	·	·
Age 10	308.3 (0.84)	·	▼	▼	·	·	·	·	·	·
Age 11	308.1 (0.89)	·	▼	▼	·	·	·	·	·	·
Age 12	309.3 (1.47)	·	▼	▼	·	·	·	·	·	·
Age 13	309.1 (1.55)	·	▼	▼	·	·	·	·	·	·
Age 14 or above	311.6 (4.70)	·	·	·	·	·	·	·	·	·

▲ *row significantly higher than column*

▼ *row significantly lower than column*

· *No difference between the two age groups*

It is plausible than younger pupils attended more often an early childhood development class. Unfortunately, the question about preschool experience had an error in the 2015 questionnaire. As a result, these data could not be used. However, in previous years pupils were asked if they had been enrolled in an Early Childhood Development (ECD) class. While pupils who reported they had been enrolled did not perform better on the tests than pupils who had not been enrolled in 2014, there seemed to be a relationship between age and the percentage of students that recorded they had been enrolled in an ECD. That is, more than 80 per cent of the pupils under 10 attended an ECD class compared to around 75 per cent of the older students.

Language spoken at home

Language spoken at home most of the time was collapsed into four major groups: Shona, Ndebele, English and other[10]. Long term changes in average English performance were only observed for the pupils that spoke Ndebele at home and that spoke "other" languages at home. The change was small but significant. Pupils speaking mostly Shona at home showed an initial improvement in average English performance, but did not maintain this improvement for the long term. The small group

[10] Other languages included Venda, Tsonga, Shangaan, Kalanga, Sotho, Ndau, Nambya and Other.

(between 2 and 4 per cent, see Table 2.14) of high performing pupils speaking English at home did not improve over the length of the project.

All African language groups gained significant long term improvement in Mathematics, but not the small, but high performing group that spoke English at home. The effect was moderate for Shona speaking pupils and large for pupils speaking Ndebele or other African languages at home. These effects are graphically displayed in Figure 2.5.

Table 2.12: Performance in English and Mathematics by main languages spoken at home since 2012

English		2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Shona	Mean performance	300.8 (0.99)	▲	304.7 (1.04)	⇹	303.6 (0.97)	⇹	304.0 (0.90)	⇹
	At or above the benchmark (%)	51 (1.5)	⇹	56 (1.8)	⇹	53 (1.7)	⇹	53 (1.7)	⇹
Ndebele	Mean performance	297.2 (1.73)	▲	302.3 (1.48)	⇹	301.4 (1.11)	⇹	303.2 (1.15)	▲
	At or above the benchmark (%)	45 (3.4)	⇹	52 (3.5)	⇹	48 (1.9)	⇹	50 (1.8)	⇹
English	Mean performance	331.5 (7.30)	⇹	328.4 (6.45)	⇹	334.2 (3.74)	⇹	330.1 (2.36)	⇹
	At or above the benchmark (%)	82 (4.7)	⇹	78 (4.8)	⇹	81 (2.9)	⇹	82 (2.5)	⇹
Other	Mean performance	291.4 (1.70)	⇹	298.2 (2.84)	▼	290.7 (1.23)	▲	298.9 (1.55)	▲
	At or above the benchmark (%)	35 (3.5)	⇹	44 (5.2)	▼	31 (2.8)	▲	45 (3.3)	⇹
Mathematics		**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Shona	Mean performance	300.8 (1.00)	▲	310.6 (0.81)	⇹	312.1 (0.67)	⇹	312.4 (0.73)	▲
	At or above the benchmark (%)	47 (1.6)	▲	65 (1.4)	⇹	69 (1.3)	⇹	67 (1.5)	▲
Ndebele	Mean performance	297.4 (1.73)	▲	307.9 (1.86)	⇹	309.6 (0.83)	⇹	311.0 (1.01)	▲
	At or above the benchmark (%)	41 (3.2)	▲	60 (4.0)	⇹	63 (2.0)	⇹	63 (1.7)	▲
English	Mean performance	322.1 (5.36)	⇹	321.6 (3.78)	⇹	329.6 (2.39)	⇹	329.0 (1.75)	⇹
	At or above the benchmark (%)	72 (6.1)	⇹	75 (4.8)	▲	87 (3.0)	⇹	84 (2.6)	⇹
Other	Mean performance	292.3 (2.17)	▲	307.8 (2.75)	⇹	305.1 (1.12)	⇹	306.7 (1.23)	▲
	At or above the benchmark (%)	34 (3.0)	▲	59 (5.7)	⇹	55 (2.8)	⇹	56 (2.7)	▲

Standard errors are reported between brackets

▲ *for postive trend*

⇹ *for no change*

▼ *for negative trend*

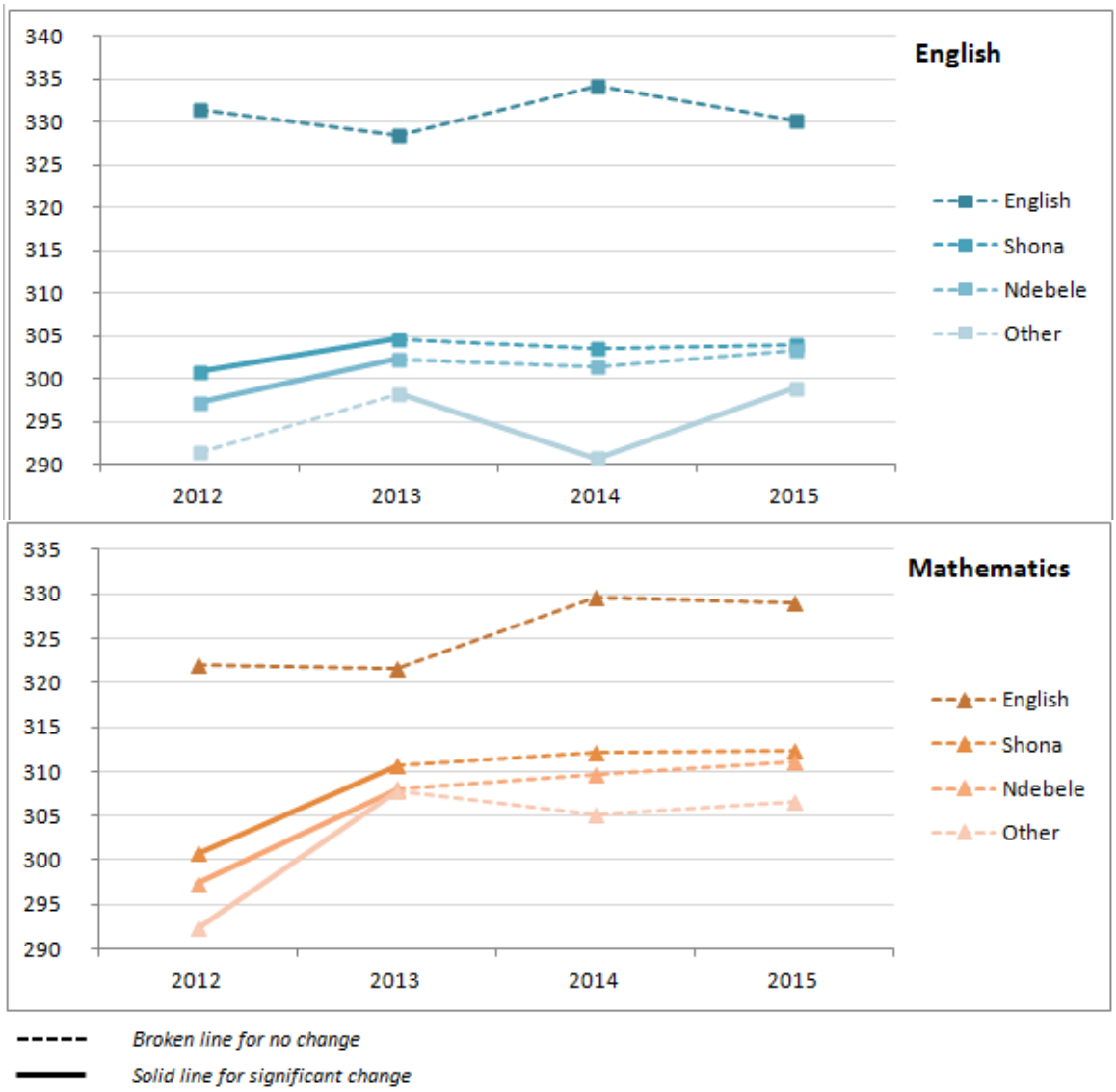


Figure 2.5: Mean performance in English and Mathematics by language spoken at home since 2012

Time per day working for the family

Pupils that worked less than one hour a day for their family performed better in English than pupils working one hour or more per day (see Table 2.13). The difference was small, but consistent across time. The pupils that worked less than one hour a day for the family gained a small improvement between 2012 and 2013 and over four years.

From 2013 the difference in performance was also significant for Mathematics achievement, although very small. Both groups gained significant and large improvement between 2012 and 2013 and over the four years of the project.

Table 2.13: Performance in English and Mathematics by time per day working for the family since 2012

English	2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Less than 1 hour	302.1 (1.30)	▲	307.8 (1.37)	◆▶	306.5 (1.35)	◆▶	306.8 (1.12)	▲
1 hour or more	299.7 (1.07)	◆▶	303.4 (1.11)	◆▶	302.5 (1.05)	◆▶	303.7 (0.81)	◆▶
Difference[a]	▲		▲		▲		▲	
Mathematics	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Less than 1 hour	301.3 (1.22)	▲	312.6 (1.19)	◆▶	313.7 (0.82)	◆▶	314.3 (0.90)	▲
1 hour or more	299.9 (1.03)	▲	309.8 (0.84)	◆▶	311.4 (0.76)	◆▶	312.4 (0.58)	▲
Difference[a]	◆▶		▲		▲		▲	

Standard errors are reported between brackets

[a] *Less than 1 hour - 1 hour or more*

▲ *for postive trend / difference*

◆▶ *for no change / difference*

▼ *for negative trend / difference*

Meals per day

As shown in Table 2.14, pupils eating three or more meals per day outperformed pupils eating two meals per day in both English and Mathematics. The difference was small in all years and both assessment domains. The difference in English performance between pupils who had two meals and pupils who had one meal a day was significant in 2014 and small in 2014, but not in the other years. In contrast, the same difference was small and significant for Mathematics in all years but 2013.

All groups showed a short term increase in English and Mathematics between 2012 and 2013, except for the pupils that had one meal a day in English. In English performance, this change was not sustained for the pupils eating three or more meals per day and was small for pupils eating two meals per day. In mathematics performance, long term gains were moderate for pupils eating three or more meals per day and large for pupils eating one or two meals per day.

Table 2.14: Performance in English and Mathematics by number of meals per day since 2015

English	2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Three or more meals	303.5 (1.28)	▲	308.0 (1.15)	◆▶	306.8 (1.31)	◆▶	307.6 (1.11)	◆▶
Difference[a]	▲		▲		▲		▲	
Two meals	296.3 (1.06)	▲	300.7 (1.11)	◆▶	300.4 (1.06)	◆▶	301.0 (0.81)	▲
Difference[b]	◆▶		◆▶		▲		◆▶	
One meal	294.8 (1.34)	◆▶	299.9 (1.88)	◆▶	297.2 (1.27)	◆▶	298.8 (1.22)	◆▶
Mathematics	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Three or more meals	303.3 (1.12)	▲	314.0 (0.92)	◆▶	314.7 (0.84)	◆▶	315.4 (0.76)	▲
Difference[a]	▲		▲		▲		▲	
Two meals	296.9 (1.06)	▲	306.7 (0.98)	▲	309.8 (0.74)	◆▶	310.3 (0.74)	▲
Difference[b]	▲		◆▶		▲		▲	
One meal	293.3 (1.58)	▲	304.0 (1.52)	◆▶	305.1 (0.85)	◆▶	307.3 (1.20)	▲

Standard errors are reported between brackets

[a] *Three or more meals - Two meals*

[b] *Two meals - One meal*

▲ *for postive trend / difference*

◆▶ *for no change / difference*

▼ *for negative trend / difference*

Number of home possessions

Pupils were asked which of the following items they have at their home: electricity, piped water, television and radio. Fifty-five per cent of the pupils recorded they had electricity at home (mains, generator or solar), 32 per cent had piped water at home, 52 a television and 72 a radio.

Table 2.15 shows performance in English and Mathematics by number of these home possessions since 2012. Pupils that possessed all four items performed better than pupils possessing only two or three items in English and Mathematics and in all four years. The difference was large. Pupils that had two or three items in their houses also performed better than pupils possessing only one or less items, but only until 2014. This difference was small in 2012 to 2014.

Pupils having one or less item at home showed a small long term improvement in English performance and a large improvement in Mathematics performance. In comparison, the other groups showed no improvement in English and only a moderate improvement in Mathematics. This interaction effect between change in performance and number of home possessions is displayed in Figure 2.6.

Table 2.15: Performance in English and Mathematics by number of home possessions since 2012

English	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Four	316.6 (2.32)	⇹	321.7 (2.57)	⇹	322.7 (1.75)	⇹	320.4 (1.71)	⇹
Difference[a]	▲		▲		▲		▲	
Two or three	298.8 (0.92)	⇹	301.3 (0.91)	⇹	300.5 (1.14)	⇹	301.4 (0.84)	⇹
Difference[b]	▲		▲		▲		⇹	
One or less	294.4 (1.02)	⇹	297.8 (1.17)	⇹	297.6 (1.00)	⇹	300.3 (0.83)	▲
Mathematics	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Four	314.2 (1.98)	▲	322.1 (1.66)	⇹	322.6 (1.11)	⇹	323.5 (1.25)	▲
Difference[a]	▲		▲		▲		▲	
Two or three	299.5 (0.92)	▲	308.4 (0.81)	⇹	310.7 (0.84)	⇹	310.4 (0.68)	▲
Difference[b]	▲		▲		▲		⇹	
One or less	294.3 (0.99)	▲	305.0 (1.04)	⇹	307.4 (0.70)	▲	309.9 (0.67)	▲

Standard errors are reported between brackets

[a] *Four - Two or three*

[b] *Two or three - One or less*

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

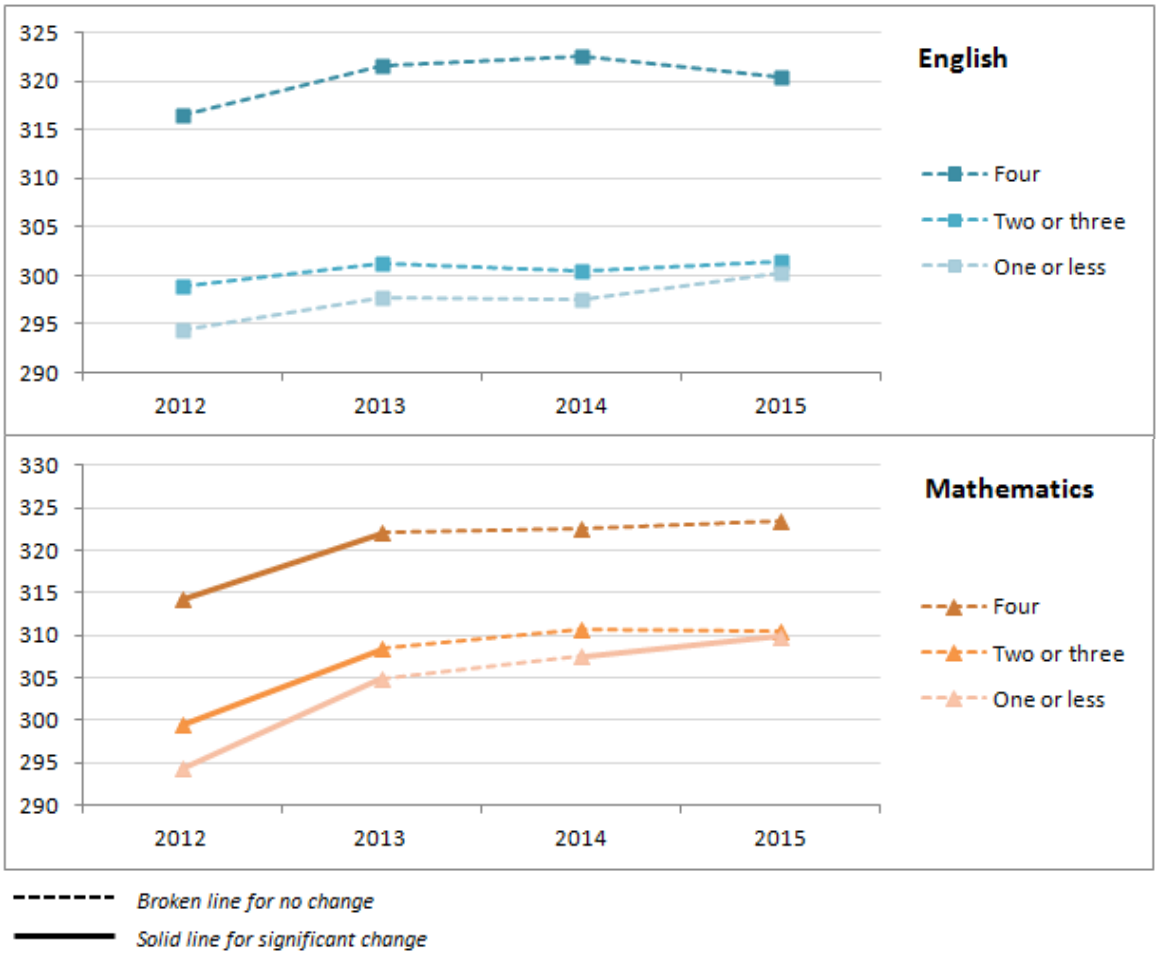


Figure 2.6: Mean performance in English and Mathematics by number of home possessions since 2012

Number of home educational resources

Pupils were asked if they had any of the following educational resources in their home: pencil, school bag, pen, desk, computer and calculator. Seventy-six per cent of the pupils reported they had a pencil at home, 60 per cent a school bag, 81 per cent a pen, 34 per cent a desk, 22 per cent a computer and 30 per cent a calculator.

Results for the number of home educational resources were very similar to the results for the number of home possessions. Pupils possessing four or more of these home educational resources performed better in English and Mathematics than pupils possessing only two or three of the items in all years. The difference was stable across time and large in English and moderate in Mathematics. Pupils that had two or three items at home performed better in English and Mathematics than pupils with only one or less item at home. However, this difference decreased from moderate in 2012 to small in 2015. The closing gap, especially between the two groups with the least resources, is shown in Figure 2.7.

Table 2.16: Performance in English and Mathematics by number of home educational resources since 2012

English	2012	⇨	2013	⇨	2014	⇨	2015	2012-2015
Four or more	315.7 (2.38)	⇹	318.9 (2.63)	⇹	320.4 (2.11)	⇹	316.8 (1.83)	⇹
Difference[a]	▲		▲		▲		▲	
Two or three	303.3 (1.10)	⇹	304.9 (0.98)	⇹	302.0 (1.09)	⇹	303.1 (0.88)	⇹
Difference[b]	▲		▲		▲		▲	
One or less	292.9 (1.02)	⇹	296.6 (1.17)	⇹	296.7 (0.97)	⇹	298.7 (0.79)	▲
Mathematics	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Four or more	313.1 (1.83)	▲	319.3 (1.53)	⇹	322.0 (1.29)	⇹	321.4 (1.12)	▲
Difference[a]	▲		▲		▲		▲	
Two or three	303.6 (1.12)	▲	311.1 (0.90)	⇹	311.5 (0.78)	⇹	312.0 (0.72)	▲
Difference[b]	▲		▲		▲		▲	
One or less	293.0 (1.02)	▲	304.3 (1.00)	⇹	306.8 (0.67)	⇹	308.1 (0.67)	▲

Standard errors are reported between brackets

[a] Four or more - Two or three

[b] Two or three - One or less

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

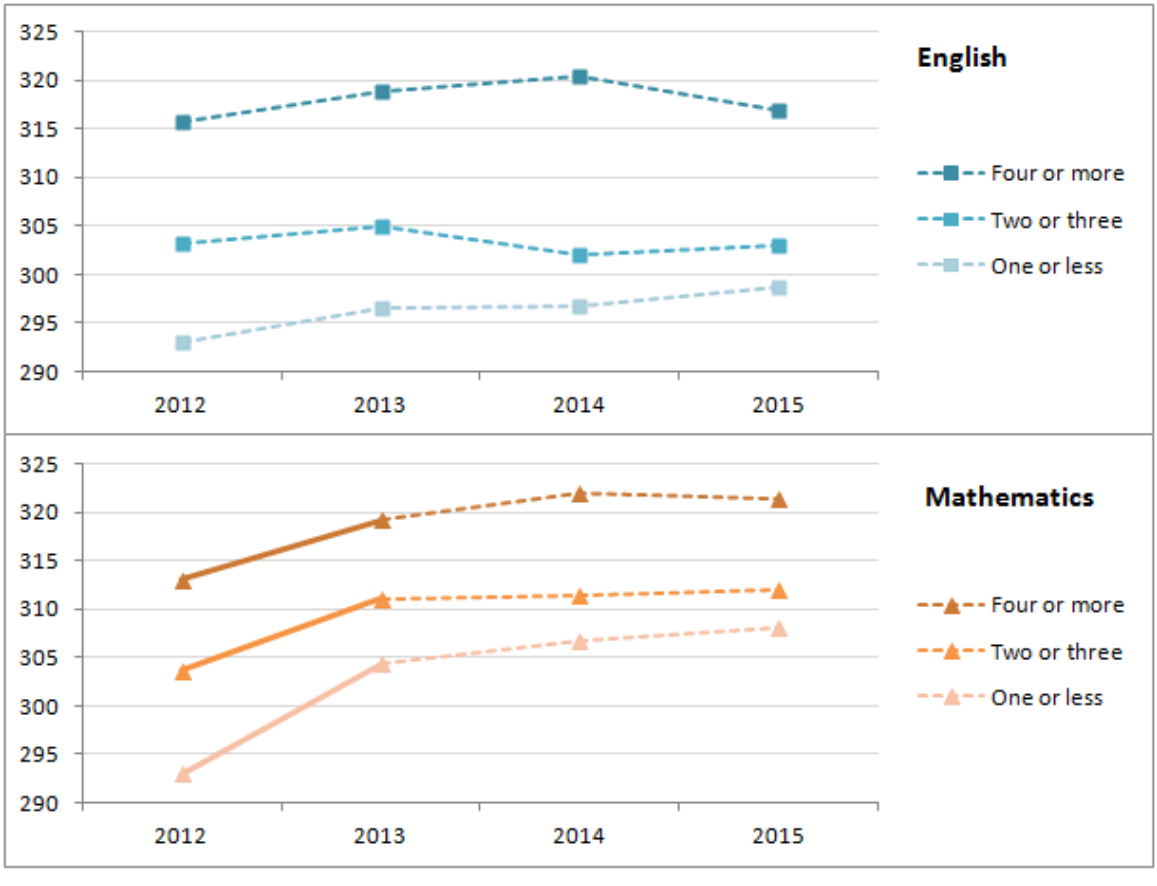


Figure 2.7: Mean performance in English and Mathematics by number of home educational resources since 2012

Highest parental education

Pupils were asked to record the highest level of education completed by each of their parents. The variable used for the analysis was the higher education of the two parents. Pupils with a parent who completed a tertiary education outperformed pupils with a parent who completed secondary school. The difference was large, but appeared to be decreasing over time. The difference between pupils with a parent who completed secondary school and pupils with a parent who completed primary school was small but significant. The difference between pupils with a parent that completed primary school and pupils with no parent completing any school was the smallest, but was still significant.

None of these groups increased significantly in English performance over four years. All but the highest group improved in Mathematics performance over four years. The decreasing gap in Mathematics achievement between the highest group and the other groups is clearly visible in Figure 2.8.

Table 2.17: Performance in English and Mathematics by highest parental education since

English	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Completed a teriary course	325.8 (2.93)	⇹	320.7 (2.63)	⇹	324.6 (2.77)	⇹	322.3 (2.16)	⇹
Difference[a]	▲		▲		▲		▲	
Completed secondary school	300.5 (0.94)	▲	304.4 (1.02)	⇹	303.3 (1.09)	⇹	303.8 (0.82)	⇹
Difference[b]	▲		▲		▲		▲	
Completed primary school	296.0 (1.02)	⇹	299.8 (1.17)	⇹	297.9 (0.83)	⇹	298.2 (0.88)	⇹
Difference[c]	▲		▲		▲		⇹	
Did not complete a school	293.2 (1.52)	⇹	295.6 (1.62)	⇹	293.8 (1.24)	⇹	296.0 (1.32)	⇹
Mathematics	**2012**	⇨	**2013**	⇨	**2014**	⇨	**2015**	**2012-2015**
Completed a teriary course	321.4 (2.02)	⇹	322.2 (1.75)	⇹	325.0 (1.70)	⇹	326.1 (1.40)	⇹
Difference[a]	▲		▲		▲		▲	
Completed secondary school	301.0 (0.90)	▲	311.1 (0.88)	⇹	312.5 (0.71)	⇹	312.8 (0.66)	▲
Difference[b]	▲		▲		▲		▲	
Completed primary school	296.3 (1.13)	▲	306.4 (1.00)	⇹	308.2 (0.65)	⇹	307.8 (0.66)	▲
Difference[c]	▲		▲		▲		▲	
Did not complete a school	292.7 (1.67)	▲	302.7 (1.38)	⇹	303.1 (0.92)	⇹	305.0 (1.30)	▲

Standard errors are reported between brackets

[a] *Tertiary - Secondary*

[b] *Secondary - Primary*

[c] *Primary - No school*

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

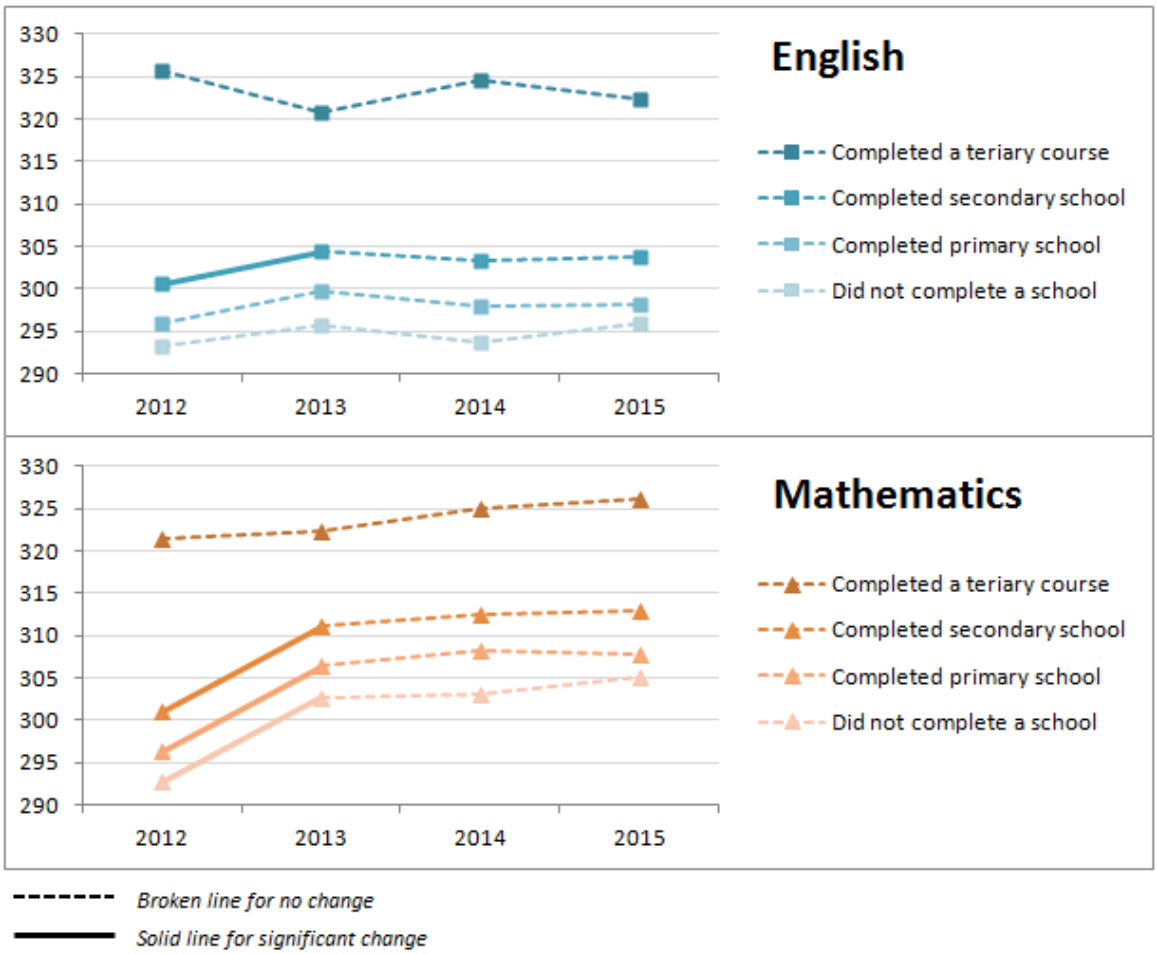


Figure 2.8: Mean performance in English and Mathematics by highest parental education since 2012

Pupil performance in Shona and Ndebele in 2015

Students and schools that were sampled for the English and Mathematics tests were given the choice to respond to one of the two African language tests (Shona and Ndebele). In 2015, two-thirds of the sampled students responded to the Shona test, one-quarter to the Ndebele test and almost one-tenth (9 per cent) to neither of these tests. Because these are self-selecting samples, no weights were applied to the analysis (they do not represent a pre-defined population definition). In addition, a consequence of self-selection is that the samples (and therefore the results) are not comparable over time. The 2015 overall mean performance in English and Mathematics was set to 300 and the standard deviation to 25.

Sample distributions of the pupils responding to the Shona or Ndebele test are recorded in Table 2.18. In addition, the mean performance was computed for each of the subgroups of gender, school type, school location and province. Girls appeared to outperform boys in both languages. The difference was small in Shona and moderate in Ndebele. Pupils in registered schools seemed better in both languages than pupils in satellite schools, with a moderate difference in Shona and a large difference in Ndebele. The difference between urban and rural was large in both languages. Pupils from Harare and Bulawayo showed the best achievement in Shona and Ndebele, respectively. The difference with the lowest performing provinces (Mashonaland West for Shona and Midlands for

Ndebele) was very large (almost one and a half standard deviation in Shona and more than one standard deviation in Ndebele).

Table 2.18: Sample distributions and mean performance of pupils responding to the African language tests

	Shona		Ndebele	
	%	Mean	%	Mean
Gender				
Boy	50	297.7	47	296.4
Girl	50	303.2	53	304.5
School type				
Registered	65	304.2	94	301.2
Satelite	35	292.3	6	282.4
Location				
Urban	23	311.8	46	308.4
Rural	77	296.4	54	292.9
Province				
Bulawayo	0		45	308.3
Harare	17	311.8	0	
Manicaland	15	301.1	0	
Mashonaland Central	15	296.0	0	
Mashonaland East	13	300.1	0	
Mashonaland West	13	290.9	0	
Masvingo	14	299.0	0	
Matabeleland North	0		22	291.8
Matabeleland South	0		29	296.6
Midlands	12	298.7	4	278.6

Conclusions

The main finding in this chapter is that overall mean English performance increased by a small amount over four years, but not the percentage of pupils at or above grade level. A large increase was observed for mean performance in Mathematics, accompanied by an increase from 46 per cent of students at or above grade level in 2012 to 66 per cent in 2015.

Girls consistently outperformed boys in both subjects, but the difference was small. Pupils in urban areas were better in English and Mathematics than pupils from rural areas. The difference was large to very large, and increased in English performance, because pupils in rural areas did not improve over the four years. Bulawayo and Harare were the highest performing provinces in both subjects and Matebeleland North the lowest. The difference between the highest and lowest performing provinces was very large in English and large in Mathematics.

Pupils who were seven years old at the time of testing performed better than other age groups, closely followed by the eight year olds and then the nine year olds. A plausible explanation for the relationship between age and performance is the level of support given by the family to do well at school. Children that are required to work for the family often start school at a later age.

The descriptive data suggest a small increase in home possessions, home educational resources and parental education. More importantly, most analyses indicate a decrease in the gap between the following two groups of pupils:

- pupils from family background with more home possessions, home educational resources and higher parental educational levels
- pupils from family backgrounds with less home possessions, home educational resources and lower parental educational levels.

To some degree, the same decrease in gap was observed between more and less meals per day and between English as a main language spoken at home and African languages spoken at home.

These findings are also consistent with the overall methodological framework for this study outlined in the Biggs model of interactive learning and discussed in Chapter 1. Pupil level characteristics such as age and home possessions, and school level characteristics such as school location as the presage factors affecting pupil learning outcomes (Biggs, 1993).

These last findings suggest a small increase in indicators of socio-economic status (SES), accompanied by a decreasing gap in educational performance between pupils from families with higher SES and pupils from families with lower SES. These trends indicate an increase in socio-economic equity. The next chapter focuses solely on the issue of socio-economic equity.

Chapter 3 – Socio-economic Equity in Education in Zimbabwe

In analysing the results of the ZELA study in the context of socio-economic characteristics of pupils and schools, ZELA also explores how Zimbabwe is providing education opportunities and achieving educational outcomes, which are an indication of equity in society as a whole.

The OECD's Programme for International Student Assessment (PISA) defines equity in education as providing all students, regardless of gender, family background or socio-economic status, with similar opportunities to benefit from education (OECD, 2013). For example, the stronger the impact of a student's socio-economic status (SES) on his or her performance, the less equitable the school system. Equity, defined in this way, does not imply that everyone should have the same results, nor does it imply teaching the same material or providing the same resources to all students.

Performance differences between socio-economically advantaged and disadvantaged pupils or between those attending rural and urban schools indicate the degree to which an education system is equitable. They often reveal how various pupil characteristics and the environment in which pupils learn are related to performance. Tracking the evolution of these disparities over time can help the Zimbabwe school system monitor whether and how inequities in education opportunities and outcomes are growing or shrinking.

While many socio-economically disadvantaged pupils succeed at school, and many achieve at high levels on the ZELA assessment, results presented in Chapter 2 suggest that SES is still a strong predictor of performance and is associated with large differences in performance across Zimbabwe.

Two of the main findings in Chapter 2 suggest a small increase between 2012 and 2015 in socio-economic status, accompanied by a decreasing gap in educational performance between pupils from families with higher socio-economic status and pupils from families with lower socio-economic status. This would suggest an increase in socio-economic equity.

To test this hypothesis in Chapter 3, a single indicator for SES was constructed from the four components of SES that were individually reported in Chapter 2: meals per day, home possessions, home educational resources and highest parental education. In addition, number of books at home was also included as an SES indicator.[11] The resulting fine grained variable for SES was continuous with a mean of 50 and a standard deviation of 10 in each of the assessment years. In addition, a categorical variable was created where pupils were divided in three equally sized groups: one group with low SES, one with medium SES and one with high SES. Both SES variables were used for analysis in this chapter.

[11] The *2015 ACER Technical Report* provides details on the development of the SES variable.

SES was not known for six per cent of the pupils in 2015, seven per cent in 2014, 20 per cent of the pupils in 2013 and 11 per cent of the pupils in 2012. These pupils were removed for the analyses in this chapter.

Performance and socio-economic status

An intuitive way to look at the relationship between performance and SES is to estimate the percentages of pupils achieving below, at and above the grade level by level of SES (low, medium, high). Figure 3.1 and Figure 3.2 show that in both 2012 and 2015 the percentage of pupils achieving below the grade level decreases with increasing SES and the percentage at or above the grade level increases with increasing SES in both English and Mathematics. For example, the percentage of pupils performing below grade level in English in 2015 was 62 in the low SES group, 51 in the medium SES group and 29 in the high SES group. Concurrently, the percentage of pupils above grade level was 5 in the low SES group, 9 in the medium SES group and 26 in the high SES group. Similar patterns can be observed in 2012 and for Mathematics (Figure 3.2).

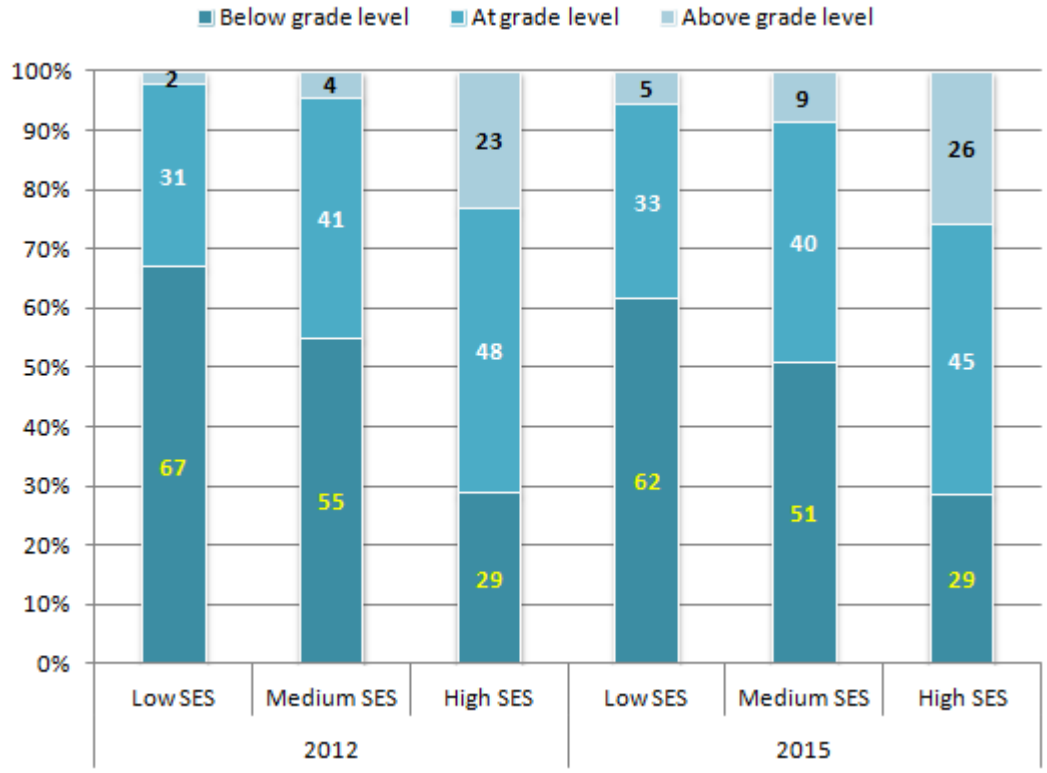


Figure 3.1: Percentage of pupils below, at and above grade level for English by SES group in 2012 and in 2015

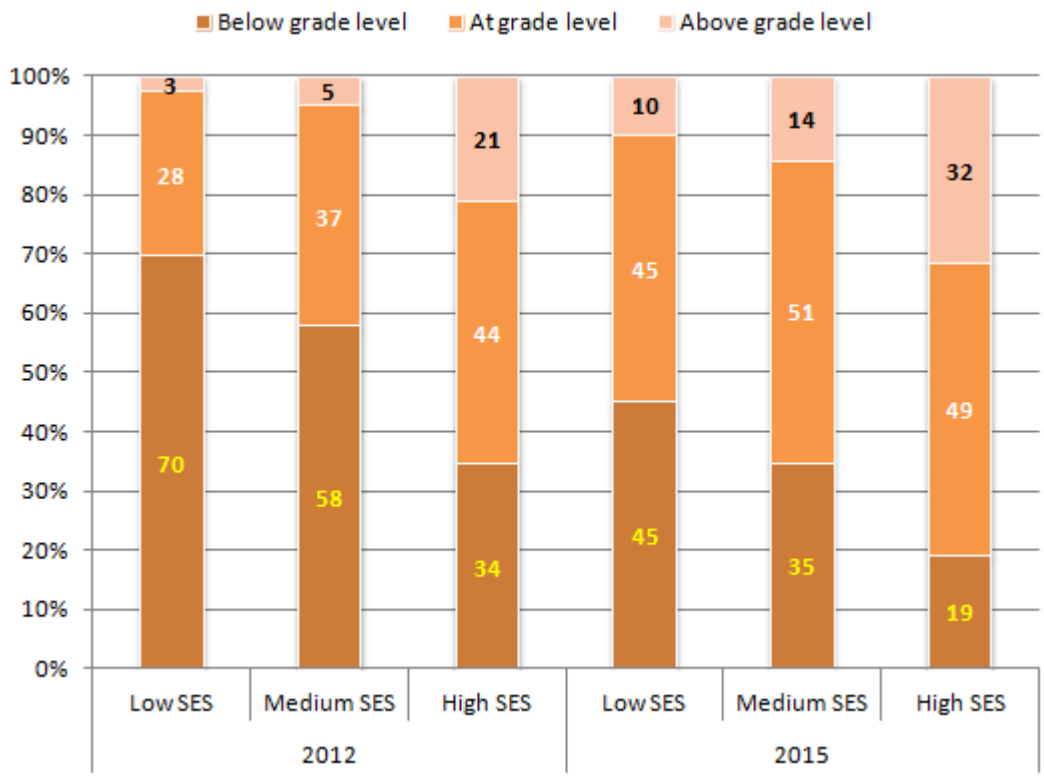


Figure 3.2: Percentage of pupils below, at and above grade level for Mathematics by SES group in 2012 and 2015

Educational systems that reflect strong relationships between school performance and SES are regarded as low in socio-economic equity. Weak relationships are regarded as high in equity and therefore more fair and just. A key question that arises from the ZELA evaluation study is whether or not equity has increased since the distribution of textbooks provided under the EDF.

Socio-economic equity since 2012

There are many ways to estimate values for socio-economic equity. Although the sets of percentages in Figure 3.1 and Figure 3.2 clearly show a relationship between performance and SES, the sets of three percentages per SES level are not easy to compare over time. One way to express and compare the level of equity within and between assessments is to compare mean performance scores between SES groups and between assessment years.

The results recorded in Table 3.1 show that pupils with medium SES perform less well in English than pupils with high SES. The difference was large in size in both 2012 and 2015, but appeared to decrease somewhat (from -16.8 scale points in 2012 to -14.8 scale points in 2015). In addition, pupils from low SES backgrounds performed less well than pupils from medium SES backgrounds. The difference was small in both 2012 and 2015, but also seemed to decrease (from 6.3 scale points in 2012 to 5.3 scale points in 2015). The decreasing gap between pupils from different socio-economic backgrounds was supported by the finding the medium and low SES groups increased in performance between 2012 and 2015, but the high SES group did not.

Table 3.1: Socio-economic equity in 2012 and 2015

		High SES		Medium SES		Low SES	
English	2012	313.5	(1.83) ▼	296.7	(0.77) ▼	290.4	(0.84)
	2015	316.2	(1.44) ▼	301.4	(0.76) ▼	296.1	(0.84)
	Difference	◆▶		▲		▲	
Mathematics	2012	312.1	(1.52) ▼	297.6	(0.79) ▼	290.4	(0.98)
	2015	321.7	(0.95) ▼	310.9	(0.60) ▼	306.1	(0.74)
	Difference	▲		▲		▲	

Standard errors are reported between brackets

The three groups are equal in size within each assessment year

▲ *for postive trend / difference*

◆▶ *for no change / difference*

▼ *for negative trend / difference*

The results for Mathematics reveal a similar picture. Again, the difference in performance between medium and high SES groups was large in 2012 (-14.5 scale points) but only moderate in 2015 (-10.7 scale points). Additionally, the difference in Mathematics performance between the low SES group and the medium SES group was small, but appeared to decrease in size between 2012 and 2015 (from -7.2 to -4.9 scale points).

These results confirm the conclusion in Chapter 2 that the relationship between pupil's socio-economic background and his or her performance has weakened somewhat over the course of the ZELA project, indicating an increase in socio-economic equity in Zimbabwe.

Differences between and within schools

A different method for analysing socio-economic equity is to focus on the degree in which schools vary from each other in performance relative to the degree in which pupils vary from each other within schools and to relate these disparities with SES at the school and pupil level. This idea is explained in more detail before the results are presented.

Average performance differs between educational systems or countries. Similarly, the performance scores of individual pupils within an educational system differ from the average. In some educational systems these differences between pupils are larger than in other ones. A mathematical way to describe this amount of dispersion or variation is the *variance*. Both the average and the variance in performance differ between educational systems and can change over time.

In a similar way, schools differ from each other in average performance and pupils perform differently from each other within each school. The balance of these two forms of variation differs between educational systems. In some countries, pupils are very similar to each other within schools, but the schools are very different from each other in average performance. In other countries, schools are on average quite similar to each other in performance, but pupils within those schools vary considerably.

In other words, the *total variance* can be delineated into *between-school variance* and *within-school variance* so that the sum of the between- and within-school variance is equal to the total variance. In the first example described above, the between-school variance is large and in the second example

the between-school variance is small. Both the between- and the within-school variance can be expressed as a percentage of the total variance.

In Zimbabwe, the total variance in English performance decreased between 2012 and 2015. The between-school variance did not change (difference=6, standard error=52, p>0.05), but the within school variance decreased significantly (difference=-105, standard error=13, p<0.05). This is graphically displayed in Figure 3.3, where the total length of the bar represents the total variance. The graph also shows that the bar for the between-school variance (the bar on the left side of the broken line) is of similar length in 2012 and 2015, while the within-school variance (the bar on the right side of the broken line) is shorter in 2015 than in 2012. As a result, the percentage of the total variance that was between schools increased from 41 in 2012 to 50 in 2015.

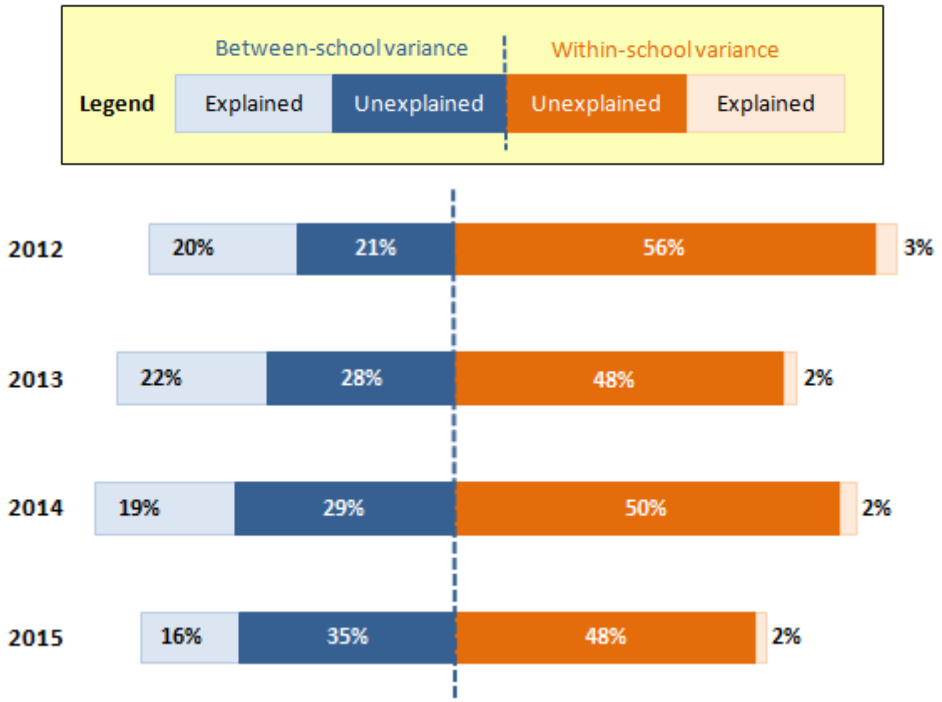


Figure 3.3: Between and within school variance in English performance, explained and unexplained by SES since 2012

With regards to Mathematics performance, both the between- and within-school variance decreased significantly—and therefore the total variance—from 2012 to 2015 (between-school: difference=-71, standard error=29, p<0.05; within-school: difference=-148, standard error=12, p<0.05). These changes can also be observed in Figure 3.4. The bar for the between-school variance is clearly shorter in 2015 than in 2012 and so is the bar for the within-school variance. The percentage of the total variance that was between schools remained similar: 36 per cent in 2012 and 37 per cent in 2015.

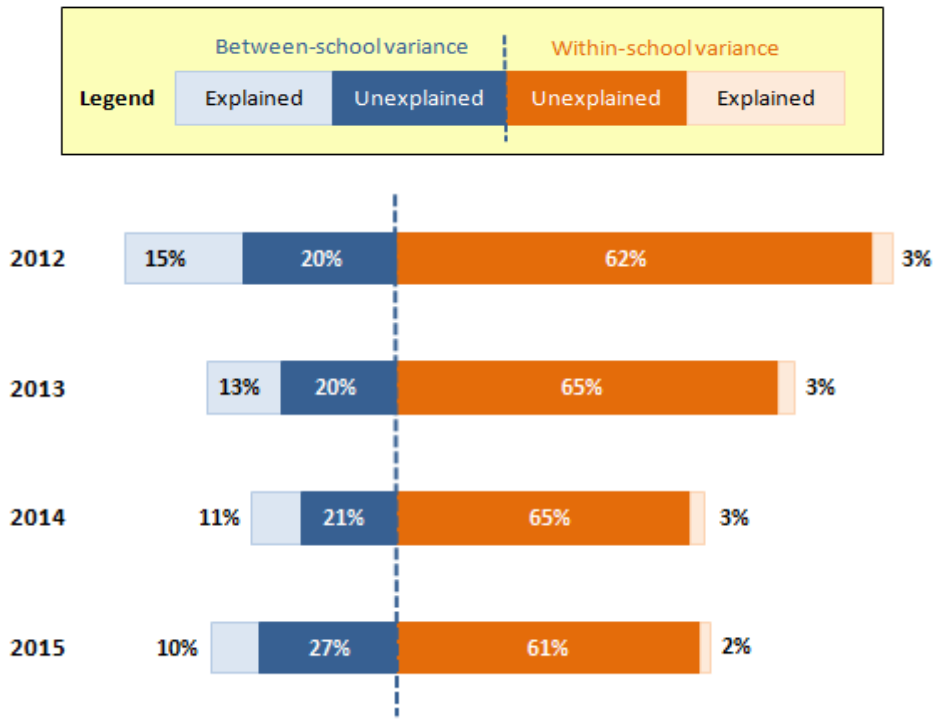


Figure 3.4: Between and within school variance in Mathematics performance, explained and unexplained by SES since 2012

Since the SES of a pupil is a strong predictor of performance, SES explains a relatively large percentage of the total variance in performance. SES can also be used to explain variance between and within schools. Results can give detailed information about equity and change in equity over time.

Figure 3.3 shows how much of the total variance was between schools and within schools and how much of these variance components were explained by the school's average SES and a student's personal family SES since 2012. The length of the full bar represents the amount of total variance. As mentioned before, the total variance decreased because of the decrease in within-school variance (the right side of the broken line).

The percentages within each bar are the percentages of the total variance in English performance. The between-schools variance is split by explained and *not* explained by school mean SES. The within-schools variance is split by explained and *not* explained by family SES. The side of the bars on the left of the broken line show that a large amount of the variation between schools was explained by difference in mean school SES. This means that the average socio-economic background of the families attending a school largely determined the level of performance in the school. This finding suggests a low level of equity. However, when comparing across time, the percentage explained by school-level SES decreased somewhat from 20 in 2012 to 16 in 2015 and the percentage not explained by SES increased from 21 to 35. This result suggests an increase in equity, because the degree in which schools differ in performance, has become less strongly associated with SES.

As described before, the total variance in Mathematics performance decreased between 2012 and 2015. This drop in variance can be observed in Figure 3.4: the total length of the bar decreases between 2012 and 2015. The balance between the proportions of the variance between schools and within school remained roughly the same. However, similar to the results for English performance,

the percentage of the total variance in Mathematics performance that was between schools and was *not* explained by SES appeared to be increasing (from 20 per cent in 2012 to 27 per cent in 2015), suggesting an increase in socio-economic equity in education.

Conclusion

Socio-economic equity in education is defined as providing all students, regardless of SES, with similar opportunities to benefit from education. Less equitable educational systems show stronger relationships between performance and SES. The first section in this chapter confirmed that there is a strong relationship between pupils' performance and their socio-economic background, but that the gap in performance between pupils from low and from high socio-economic backgrounds has decreased between 2012 and 2015. These results are also aligned with the Biggs model used as the methodological framework for this study by highlighting the input-process-output model of interactive learning.

Generally, educational systems with lower socio-economic equity consist of schools that differ more from each other in average performance than educational systems with higher socio-economic equity. In other words, in those countries or systems higher performing students attend similar schools together, while lower performing students attend other schools. In addition, the variation in average school performance is associated with the average SES of the families attending the schools. The divide can be caused by factors such as urban versus rural areas, locations of schools within expensive living areas versus cheaper areas and differences in school fees.

When examining variation in performance on the ZELA test, the first observation was that the total variance in performance decreased between 2012 and 2015. For English performance, only the disparity between pupils within schools decreased, but for Mathematics both the disparities between school and between pupils became smaller over time. This result could be a sign of improved learning opportunities for all students,

The disparity between high and low performing schools was for a large part explained by the average socio-economic background of the families attending the schools. However, the proportion of this disparity that was explained by SES appeared to decrease between 2012 and 2015, which is another indication of growing socio-economic equity in education in.

Chapter 4 - Characteristics of high- and low-performing schools in Zimbabwe

This chapter explores key themes that emerged from qualitative case studies of eight schools from a range of rural, remote and semi-urban locations in Zimbabwe. Data was collected during the 2013 and 2014 monitoring cycles. The case studies explored characteristics of high- and low-performing schools. They provided insight into the contextual factors that may impact student learning outcomes. The study also explored stakeholders' perceptions of the ETF, specifically the textbooks and teaching and learning materials distributed to schools and their perceived impact on student learning outcomes.

Chapter 2 discussed findings related to performance overall and by pupil demographics and family background variables, while Chapter 3 discussed how socio-economic equity in Zimbabwe is related to learning outcomes of students. The explicit aim is to extend understanding on how these contextual factors contribute to student learning outcomes at different schools. Given that nearly 80 per cent of schools in Zimbabwe are classified as rural or remote (see Table 2.1), the sample of schools and stakeholders represents a wide variety of relevant educational contexts and issues that may impact student learning outcomes.

The following two research questions guided the ZELA case study component:

1. What are stakeholder perceptions of the ETF?
2. What contextual factors enable and/or constrain the ETF from meeting its goal of increasing access to quality education in Zimbabwe?

Interviews with key stakeholders supplement the quantitative analysis with an exploration of structures, attitudes and behaviors that may contribute to the education context. Six different groups of stakeholders were interviewed from each case study. These stakeholders included:

- School heads
- Grade 3 teachers
- Grade 3 pupils who took ZELA
- Parents of Grade 3 pupils
- School Development Committee (SDC) representatives
- District Education Officers (DEOs).

Stakeholders provided perspectives on resources that a child has access to both at home and at school. They also provided a richer level of detail about the factors in the lives of families that

constrain their ability to actively engage and participate in education. The case studies also explored stakeholder perspectives on teacher training and the ability to retain teachers. While the issues are complex, a high rate of teacher turnover affects rural schools, in particular. Finally, the stakeholders provided detailed information about the impact of supervision and professional development - schools that had frequent contact with DEOs were in less remote locations and had more opportunities to access professional development.

The case studies provide an indication of the complexity of school experiences for a range of stakeholders, as well as insights into the findings from the quantitative study. Importantly, a key tenet of qualitative research is that "reality is constructed by individuals interacting with their social worlds" (Merriam, 1998, p. 6). Qualitative research captures data on perceptions of actors, providing a holistic overview of the study and multiple interpretations of data (Miles & Huberman, 1994).

The following discussion explores four themes that consistently emerged from interviews with stakeholders during the school case study visits. These themes include school location, school facilities and funding, school and home educational resources, and parents and communities.

School Location

Qualitative and quantitative evidence indicates that school location may be a factor related to pupil performance. School location was reported by a number of stakeholders to have an impact on the ability of schools to retain teachers. The rate of teacher turnover also appears to be affected by location, accessibility and infrastructure with five of the eight schools reporting consistently high rates of teacher turnover. One School head suggested that teacher retention is influenced by remoteness and inaccessibility of schools, poor and inadequate housing, and lack of necessary social amenities such as shops, hospitals, electricity and recreation facilities.This commentary is supported by results reported in Chapter 2 that indicate pupils in urban schools perform better than their counterparts in rural schools.

Research indicates that recently qualified teachers are more likely to be placed in disadvantaged schools (Ingersoll 2002. Teachers in Zimbabwe are required to serve initially in rural areas for two years before placement in urban centres. This requirement contributes to high levels of new and inexperienced teachers in rural schools; and, there is a pattern of teachers focusing on moving to another school once they have completed their minimum period of service. When coupled with difficult conditions experienced by teachers in many rural schools, the result is higher rates of turnover. At the same time, these are the same teachers who may need mentoring and support of more experienced qualified teachers.[12] The World Bank (2015) estimates that 67 per cent of Zimbabwe's population is rural and this number has increased between the period 2011-2015. More

[12] Mukeredzi (2013a) discusses the use of teachers with limited professional experience in rural schools and the links to lower-quality education and poor student outcomes. The author questions inexperienced teachers' ability to professionally grow and develop in rural contexts. Mukeredzi further suggests that rural schools in Zimbabwe are far apart, without communication facilities, electricity or piped water, poor roads and unreliable transport (2013a, p. 87). UNESCO (2005) suggests the development of a national framework for teachers that defines the deployment of new and experienced teachers, as well as a program of incentives, such as housing or housing subsidies or further study opportunities, to attract teachers to difficult, rural areas.

people in Zimbabwe live in rural areas, and evidence from the quantitative and qualitative components of ZELA indicate differences in pupil performance in rural and urban areas.

School location and consequent accessibility or inaccessibility was perceived to impact on teacher retention, supervision and staff development. Three schools were more accessible and reported lower teacher turnover. Furthermore, these schools reported more regular supervision and staff development from DEOs. The five schools in rural locations reported high teacher turnover and mostly received supervision and staff development internally or through cluster supervision.

One DEO reported the challenges of rural schools in his district:

> Most of the schools I am visiting do not have qualified teachers for subjects, and some do not know expectations, and as a result we find that pupils do not pass, especially in technical subjects. (DEO)

In discussing staff development for teachers at rural schools, a DEO said that a "cascade" method of training was used for staff development. He reflected:

> After supervisions, we identify gaps and see the trend of problems and develop workshops from those findings. Training could be school-based or in clusters. If it concerns heads of schools, then it is at district level. Trained teachers are expected to cascade down with workshops for the rest of the teachers at the school and teach them what they have learned. (DEO)

One school head discussed his strategy for staff development at the school level. His school is in a location accessible to a paved road and not more than 20 kilometres from the district office:

> We have staff development every year before they start. Usually we do record keeping and I staff develop them on how to plan and map pupils, how to set tests, and how to keep resources/texts. Also teachers demonstrate to each other. (School Head)

A teacher at the same school offered her perspective on staff development:

> We staff develop each other after a fortnight. In staff development a teacher chooses a topic/subject you are familiar with and you teach it to your colleagues and they become your pupils. The staff development sessions help me very much in many areas. (Teacher)

In general, stakeholder comments indicated that school location was a key factor in the ability of a school to retain qualified teachers, as described in the first statement by a DEO. Schools also address staff development with a variety of methods and supervision strategies. For example, one DEO described a "cascade" method of training as a strategy for staff development, while the School head and teacher worked with strategies where teachers themselves were actively involved in a frequent program of in-school staff development. Both DEOs described experiences in relation to rural schools. The comments above by a School head and a teacher are from a school that is in a more accessible location, than those described by the DEOs.

School infrastructure and funding

Developing school infrastructure is primarily the responsibility of the SDCs through school fees and levies. The ability to maintain school infrastructure is compromised because many families cannot

afford to pay school fees. Schools also have a responsible authority that manages the school, and that authority is deemed to give direction to the school. Schools with other sources of funds had comparatively well-developed infrastructure than those that depended exclusively on school fees.

The three schools in the case studies that performed below grade level on ZELA had comparatively fewer resources and less access to funding. Funding initiatives such as Basic Education Assistance Module (BEAM) and School Improvement Grants (SIGs) are inputs to schools that have the potential to support instructional processes and learning outcomes. One DEO commented on the importance of working with SDCs to support the provision of school infrastructure:

> We work hand in glove with SDCs, and these should be providers of infrastructure. We decide on amount of levy depending on community needs - the higher income, the higher levy. SDC has to source funds from other stakeholders in their communities, and this has to be approved by the provincial office. Any other members of the community can chip in and assist in terms of building accommodation for teachers. (DEO)

Stakeholders interviewed for the case studies suggested that lack of infrastructure and funding presented challenges for schools in terms of supporting the learning needs of their students and the accommodation of their staff.

In regard to infrastructure, data collected from the School head questionnaires reflecting the number of permanent, temporary and open-air teaching areas at schools suggested that the majority of classrooms in registered schools is permanent (82 per cent), while for satellite schools the majority of classrooms is temporary or open-air (76 per cent). Two teachers at different schools offered their opinions on how temporary classrooms might be related to their students' learning outcomes:

> Our pupils are performing below par, when in actual fact they should be doing better; the reason being that their learning environment is not conducive. They have the potential to do very well. They literally write when they are sitting on the floor. Imagine the pain they experience from morning until four. Their writing is not good - the child is sitting on a broken brick and cannot concentrate on what the teacher is saying. The majority have the potential. (Teacher)

> There is overcrowding in the classrooms and no boards. We tried to do makeshift boards, and this makes out teaching very difficult (on the walls). …very difficult to form the letter. We do use manila papers to demonstrate. We try to make do with what we have. (Teacher)

Chapter 5 discusses school facilities in regard to availability of water and electricity at schools.[13] Overall results from the ZELA School head questionnaires show that pupils in schools with access to both electricity and water performed better in English and Mathematics than pupils attending schools with access to only water, only electricity or neither. It should be emphasised that this is not a causal relationship, rather facilities and funding may be some of many factors that affect pupil

[13] The original design of the School Head questionnaire used the terms facilities and infrastructure interchangeably. These questions specifically addressed the number of permanent, temporary and open air classrooms; types of toilets available; and, source of water, electricity and availability of a landline telephone.

performance. One teacher reflected on the complexity of the issue and how the infrastructure might impact her decision to leave the school:

> My door is not lockable, there is a flush toilet but the system is not operational. The roofs of the houses are leaking, they haven't been maintained. I am looking forward to moving, unless the conditions become better here. (Teacher)

One School head attributed a high teacher turnover rate to poor teachers' accommodation, and the remoteness of the school. Parents at the school suggested that the high teacher turnover and frequent changeover of teachers in the middle of the year disrupted pupils' ability to learn.

On the other hand, the School Head at one school located near a major town and next to a main road that received financial support from the nearby cement factory said:

> Teachers are provided housing by the nearby cement factory, and pay rent to the factory at below-market rates. The teachers have piped water and electricity in their houses, both of which are supplied by the factory. There is also a low rate of teacher turnover at the school. (School Head)

Another school was located near a main road, but had inadequate accommodation for teachers with seven houses shared among 21 teachers. However, there is a low rate of teacher turnover. The Deputy Head said there is reliable transportation to and from the school, and teachers and families are regularly able to visit urban areas and shops. This suggests that accessibility to urban areas might be a factor for teacher retention at this school.

Some School heads and DEOs commented that parents' ability to pay school fees was related to the school's ability to maintain infrastructure and provide resources. The School head questionnaire asked how many pupils were in fee arrears and responses from all schools included in ZELA 2015 indicated that the number of pupils in fee arrears is a nationwide problem (60 per cent of pupils are in fee arrears). Table 4.1 shows the percentages of pupils in fee arrears by school type, school location and province. For the provinces, the percentage of pupils in fee arrears ranged from 46 in Harare to 71 in Midlands.

Table 4.1: Percentage of pupils in fee arrears nationwide, by school type, location and province

	Pupils in fee arrears (%)
All schools	60
School type	
Registered	59
Satelite	68
Location	
Urban	51
Rural	63
Province	
Bulawayo	50
Harare	46
Manicaland	59
Mashonaland Central	68
Mashonaland East	54
Mashonaland West	64
Masvingo	55
Matabeleland North	67
Matabeleland South	55
Midlands	71

The following statements from different stakeholders describe, from their perspectives, how lack of funding affects the ability of the school to maintain infrastructure and provide resources to pupils. Some of the critical areas include service delivery and provision of meals for children who are reportedly not getting enough to eat during the day.

> Almost 188 are in arrears which adds up to $16,000. This means that there are 50 per cent of families struggling to pay school fees...this impacts on service delivery at the school. (School head)

> Children don't get enough to eat at school and nothing is done for fundraising. Parents are not paying levies, for seven years for some kids. (DEO)

Chapter 5 discusses patterns in pupil performance and school budgets. The School head questionnaire also asked whether or not School heads had received a School Improvement Grant (SIG) and for what purpose they allocated SIG funds. Eighty-seven per cent of the pupils' school heads reported that they had received SIGs. School heads reported using allocations of the SIG for the following purposes: 64 per cent allocated some of the SIG for minor repairs, 76 per cent for reading materials and textbooks, 77 per cent for Orphans and Vulnerable Children (OVC) levies, 77 per cent for teaching and learning materials, and 22 per cent for unspecified expenses. In the case study interviews, School heads said they prioritised the aforementioned allocations as general priorities of spending at their schools.

The following statements from the qualitative study are perspectives of how a School head and a teacher engage with the challenge of continuing to provide basic resources for pupils and teachers at their schools:

> If there is money I buy resources (chalk, paper, pens, Bibles, etc.) and teaching materials. I work on motivation, particularly during Wednesday meetings with staff...We get very little money and the Government takes levies of 10 per cent of pupils' fees collected from the school. Government puts the responsibility of pupils' learning on teachers.[14] I have a good performing teaching staff and little disagreement. (School head)
>
> We also have problems with stationery — chalk, felt pens, etc. Sometimes teachers have to buy their own chalk. (Teacher)

The School head outlined how he works with teachers "on motivation" and prioritises available funds for "resources." The teacher, on the other hand, felt that all teachers at her school had to purchase their own classroom resources. The following section discusses more specifically stakeholder perceptions of school and home educational resources.

School and home educational resources, including textbooks

The School head questionnaire asked *how* the schools used textbooks. The vast majority of respondents stated textbooks were used in classroom instruction (99 per cent). Less than half of the school heads indicated the textbooks were used for homework; added to this was the fact that only 43 per cent of schools allowed pupils to carry books home.

The Pupil questionnaire asked pupils *where* they used the textbooks available at their schools. Ninety-one per cent of pupils reported they used textbooks in the classroom, 22 per cent used textbooks at home, and five per cent stated they did not use textbooks.

One DEO specifically described textbooks provided through the ETF as a "new lease of life for Zimbabwe's primary school children." The following two teacher perspectives indicate how the teachers suggested textbooks had supported their teaching practice:

> Those books provided by UNICEF were very helpful, they really helped me. It was an advantage to them [meaning the pupils]. Before, I would write a passage on the board. When those books were provided everyone had a book and I could point to a passage in the book and it was simpler to teach. (Teacher)
>
> One child will have his own book and the child can read at his own pace and I can go to another child and ask her to read a line according to her ability. Some can read a passage, some two lines, some can read the whole story. If you have a text you can deal with them individually. (Teacher)

Both of the above quotations relate closely to the evidence from the School head and Pupil questionnaires in regard to the use of textbooks. Overwhelmingly, both qualitative and quantitative evidence indicates that textbooks are used in classroom instruction. The quotations above give additional commentary on how teachers used textbooks in everyday practice.

[14] Schools pay a portion of the fees into the Better Schools Programme Zimbabwe (BSPZ). These fees are pooled and contribute to a fund that is used by district and provincial offices for a range of activities.

At the same time, one School head recalled that in 2010, the ETF supplied exercise books/stationery for pupils and schools, but this was a 'one-off'.[15] Alongside this, one DEO said that, "ETF textbooks were not issued in all the subjects. Those subjects left out are struggling." A school head added:

> The other books that are not covered by UNICEF, sometimes in subjects like Social Studies or Moral Education, only a few teachers will be having the resource book..., like Moral Education — they find it difficult to understand the material in the textbooks...but especially in English they find it very very difficult to understand, especially in the lower grades.

Inadequate provision of learning materials, particularly stationery, was another constraint. The provision of stationery, like textbooks, was, as noted above, a one-off exercise. The majority of the schools consulted stated they were out of stationery stock and found it difficult to provide stationery and other learning materials from the school budget.

As described above, the School head questionnaire also asked whether or not School heads had received a School Improvement Grant (SIG) and for what purpose they allocated SIG funds. Eighty-seven per cent of the pupils' school heads reported that they had received SIGs. School heads reported using allocations of the SIG for the following purposes: 64 per cent allocated some of the SIG for minor repairs, 76 per cent for reading materials and textbooks, 77 per cent for Orphans and Vulnerable Children (OVC) levies, 77 per cent for teaching and learning materials, and 22 per cent for unspecified expenses.

In the case study interviews, School heads prioritised the aforementioned allocations as general priorities of spending at their schools. One School Head explained that, "Teaching and learning materials for the teachers is a priority... without those they cannot do the job." This aside, a number of school heads at the case study schools reported that providing teachers with adequate teaching and learning materials remains a challenge. Some schools keep books and textbooks for students and teachers in a locked room or cupboard, and they are not allowed to take the books home. One school said it provided students with pens and pencils, but could not provide all students with stationery.

A number of school heads included in the case study schools stated that they did not have syllabuses in some subjects. One School Head said, "We went to AFM and other schools in town and we photocopied for these subjects." Another School Head said the school does not have enough copies of the syllabus, and explained that the curriculum development unit told him it was no longer printing the school syllabus,[16]

School Heads at two of the schools included in the case studies stated that they received donations from local church foundations; and, one school received financial support from a nearby cement factory. These external donations were used to build new classroom blocks and purchase additional teaching and learning resources.

[15] It should be noted that recollection of exact dates when an event occurred was not clear, and sometimes contradictory with accounts from other stakeholders. The dates used in reporting the accounts of stakeholders are the dates they stated during the interviews.

[16] It is possible that the Curriculum Development Unit ceased printing and circulating school syllabi during the period of the 2014 case study research because of the 2015 Curriculum Review conducted by MoPSE.

The stakeholders interviewed for the case studies suggested that textbooks procured through the ETF have contributed to improving student learning outcomes. Benefits of the textbooks were identified at the following three levels:

- The student level where they are able learn at their own pace, extend their learning beyond the classroom and interact with more detailed content;
- The teacher and school level with increased teaching and learning resources;
- The family level in which money that had been spent on textbooks could be directed to other necessary family expenses; at the community level textbooks have enabled access to educational resources for OVCs and disadvantaged families.

Two-thirds of School heads at rural schools reported that their pupils have access to at least five textbooks distributed by UNICEF as part of the ETF (compared to at least four in urban areas). The following teacher commented on his recollection of receiving textbooks and education resources distributed as part of the ETF:

> (We were) also given exercise books (2010-2011) which are issued to children and distributed when they are in need of them, since parents cannot afford to provide. At present, we don't have a problem of children coming to school without exercise books or pens, the school provides them. (Teacher)

Additional comments from teachers about the availability of textbooks procured via the ETF include the following:

> It really improved our learning. We were given textbooks in 2010. The situation before was a bit pathetic, and now it is 1:1. (Teacher)

Another teacher reported that pupils were taking the initiative to borrow the books particularly over the weekends.[17]

> Pupils borrow them on weekends and get help from home. In class it improved the learning situation by improving the work of teachers, helping, and not so much time trying to explain. (Teacher)

School staff also acknowledged receiving exercise books and pens for students, as well as teacher guides and materials through the ETF distribution. However, they said that the supplies of resources such as exercise books and chalk have run out. that “The whole school used to share one box of chalk, but problem is they (the chalk) are over now” (Teacher). In some instances, textbooks and learning materials procured as part of the ETF have been the only source of learning and teaching resources for the school. For example, one School head said, "the school does not have the current school syllabi and that parents are struggling to buy textbooks not procured under the ETF" (School Head).

[17] It should be noted that of the schools visited for the case studies, only two of eight allowed students to take books home either on weekends or after school. School heads and teachers said they preferred students use the textbooks in the classrooms or the school library.

> (We were) also given exercise books (2010-2011) which are issued to children and distributed when they are in need of them, since parents cannot afford to provide. (School Head)

One parent (speaking on behalf of the parent group) stated that they appreciated that their children had textbooks and that there was change in the learning of their children. On writing materials supplied by ETF the parent commented, "it gave us some breathing space financially, but now we are again spending our money because there is no more." She highlighted that it is a struggle for parents to pay school fees and buy writing materials for their children. Another parent group and SDC members summarized some of the following benefits of receiving textbooks:

> Textbooks provided at school meant that families had more available funds for other family commitments such as buying learning materials, uniforms and food.

Stakeholders reported that children from low-income families in the community who previously could not afford textbooks, among them OVCs, now have access to a textbook.[18] The following section explores how school staff perceive how parents and communities are able to support their children's engagement in education.

Parents and communities

Parents' SES impacts on five important components that have been found to influence learning outcomes: paying school fees, school attendance, the ability to provide sufficient food for the child, home possessions and the ability to provide educational resources for learning opportunities. Most parents in the case studies depend on agricultural activities (dependent on rainfall) for their livelihood. Many parents said they could not afford to pay school fees and provide sufficient food for their families.

Parents in one rural school said they were mainly subsistence farmers and rely on their farm produce for their income. The SDC representative explained that parents were struggling to pay school fees and feed their families, "This is a rural area and it is hard for parents to afford the money."

One School head reported the challenges and competing priorities experienced by families living in rural areas:

> For example, when families are planting and they need the kids to look after the cattle while the parents are in the fields. When they have many kids, they will give the opportunity to one to come to school one day, the next another day (i.e. John on Monday, Mary on Tuesday, etc.). At times, children have to wake and do work (wake up around 4-5am) before going to school. Sometimes you hear others ploughing fields at 2am. Then go to school. Then go back to field after 5pm. Kids at this time are more tired. (School head)

The above quotation reflects on some contextual factors that a School head suggested might affect student learning outcomes. Families may need to prioritize work over sending their children to school,

[18] Parents and SDC representatives in general said they were not very sure about the term ETF but were aware that the school received some resources in 2011, noting the resources were UNICEF textbooks.

and may only be able to send one child to school at a time. Similarly, extended work hours required during planting and ploughing seasons result in children being more tired in school.

One School head outlined his experiences with the school community, and the perceived effects it had on the children at his school:

> A few parents here don't care about their children's education. Sometimes parents tell their children not to come to school. There is too much interference from the community. They literally want to run the school and this has made it impossible for the effective formation of an SDC. Without an SDC a school cannot operate to its fullest. All these things have a negative impact on the learner. All this squabbling between school and community… affects children the most - it affects teachers and pupils. (School head)

Stakeholders interviewed for the case studies suggested that parents' support was an important factor for their children attending school. A School head reported the school had made efforts to communicate and meet with parents, but he suggested "they did not appreciate the importance of education." Other teachers interviewed at the school suggested that a majority of parents had a low level of education (meaning parents had attended or completed primary education). However, parents at the aforementioned school suggested that extra lessons should be provided for children who were struggling with reading and writing.

One teacher related the support that parents and the community had provided to the teaching staff at the school:

> Teachers are motivated by the support and appreciation they received from the head of the school and the parents. (Teacher)

The SDC at another rural school suggested the school had a supportive community. One example of this was an initiative to install electricity at the school, which was a community initiative lead by the parents and SDC. The SDC explained that this was an attempt to curb the high rate of teacher turnover.

Chapter 2 discusses findings related to pupil performance based on pupil demographic and family background variables. Pupils whose parents had completed a tertiary course performed better than their peers whose parents have not completed a tertiary course. Overall, a higher level of parent education has the potential to have positive impact on pupil performance. Pupils who had more home possessions and home educational resources also performed better than their peers. Either way, School heads, teachers and members of SDCs interviewed during the school case study visits expressed opinions that parents and communities are related the learning performance of pupils.

Conclusion

Findings from the case studies indicated that there are a range of enabling and constraining factors that relate to student learning outcomes. SES, and its components such as home educational resources and parents' level of education, has strong associations with pupil performance. School location and infrastructure were other important factors related to student learning outcomes. For example, infrastructure such as adequate teacher housing and location to transportation appeared to be a key factor in a school's ability to retain teachers.

Furthermore, the qualitative studies provided opportunities for stakeholders to express their perceptions of resources procured through the ETF. Importantly, the case studies present in-depth accounts of the issues and challenges faced by individual schools in Zimbabwe in terms of their efforts to improve student learning outcomes and access to quality education for all children in the community.

This chapter was organized around four themes that include school location, school facilities and funding, school and home educational resources including textbooks, and parents and communities. These themes provided a framework for addressing the key questions that guided the ZELA case study component.

First, stakeholders provided a range of opinions about their perceptions of the ETF. While some respondents had difficulty in remembering exactly when they received textbooks via the ETF, they acknowledged that textbooks and resources were critical inputs to schools. School head and Pupil questionnaire results indicated that textbooks were used primarily in the classroom. Teachers who were interviewed suggested that textbooks helped them in their daily teaching practice, while one DEO went so far as to express the textbooks "were a new lease of life for Zimbabwe's children." Stakeholders in some of the schools included as case studies suggested that a number of parents in their communities would otherwise struggle to provide any educational resources for their children if it were not for support received through the ETF.

Second, there are a wide range of contextual factors that enable and constrain the ETF from meeting its goal of increasing access to quality education in Zimbabwe. In addition, the chapter also explored a range of factors that may also impact pupils' ability to access equitable education, and schools' and teachers' abilities to support learning. As discussed in the previous paragraph stakeholders interviewed suggested that textbooks and resources had benefited their schools. At the same time, stakeholders offered opinions on a range of constraints. Funding and school facilities affect the school's ability to provide a safe learning environment and maintain school infrastructure. School location may be related to student learning outcomes. Family and community support is also suggested to affect teaching and, consequently, pupils' performance in school. Stakeholder opinion suggested that teacher retention in rural schools with inadequate infrastructure can be a problem.

These characteristics are the meta-contextual and pupil-specific factors as part of the presage stage of learning exemplified in the Biggs model. These factors similarly influence data output, or learning outcomes. In other words, input through process to output portrays a storyline for a pupil cohort. As discussed in Chapter 6 of this report, this storyline has the potential to inform policy implications.

Finally, exploring the characteristics of high- and low-performing schools in Zimbabwe gives insight into the range of variables discussed in Chapters 2, 3 and 5. For example, Chapter 3 concludes that disparity between high- and low-performing schools was for a large part explained by the average socio-economic background of the families attending the schools, and the perceptions of stakeholders enable an insight into how schools and families may or may not experience disparity. Chapter 5 explores school characteristics and pupil performance in English and Mathematics.

Chapter 5 - Performance in English and Mathematics within the Zimbabwe educational context

The previous chapter highlighted some school and teaching factors that were affecting teaching and learning according to teachers, head teachers, SDC members and parents at the case study schools, in addition to DEOs. This chapter describes relationships found in the full population between pupil performance, characteristics of the school and learning environment. All reported results in this chapter are based on pupil-level analyses. That is, pupils were the unit of analysis, even for variables that were collected at school-level. The type of reported statistics and comparisons are the same as in Chapter 2.

While school type was known for all schools—because it was used as a sampling variable—other data collected from the schools were missing for more than a third of the pupils in 2012. This was caused by error in school identification codes for the school questionnaire and possibly some lost questionnaires, which could not be recovered after data collection. Pupils without school questionnaire data performed on average equally well to pupils with school questionnaire data, suggesting that excluding pupils with missing school data did not bias the results.

School characteristics

Some descriptions of school characteristics were collected in the school head questionnaire. The characteristics that were collected and related to performance for this chapter are: school type (registered versus satellite), school facilities (electricity and water), school budget (the total budget divided by the school size) and the distance between the school and the district centre.

School type

The Zimbabwean school system consists of two school types: registered schools and satellite schools. Satellite schools were established earlier, but became more prevalent after the Land Reform Programme of 2000 in former commercial farming areas to improve access to education for the Zimbabwean population.[19] However, many of these satellite schools do not have the same facilities, infrastructure and resources as registered schools. Consequently, school type was expected to relate strongly with performance. As presented in Table 5.1, about 90 per cent of the Zimbabwean pupils attended registered schools and 10 per cent attended satellite schools.

[19] See for example Mutema, F. (2014). An examination of the learning conditions in Zimbabwe's satellite schools: A case of Somabhula Resettlement Area - Midlands Province. *International Journal of Humanities and Social Science 4*(8), 284-290, for an extended discussion on the background and challenges experienced by many of Zimbabwe's satellite schools.

Table 5.1: Mean performance by school type in 2012 and 2015

		Registered			Satellite	
Percentage	2012	91	(0.4)		9	(0.4)
	2015	89	(0.4)		11	(0.4)
English	2012	300.8	(1.09)	▼	291.4	(0.85)
	2015	305.6	(0.87)	▼	293.3	(0.97)
	Difference	▲			◆▶	
Mathematics	2012	300.6	(1.06)	▼	293.4	(1.05)
	2015	313.3	(0.65)	▼	304.3	(0.91)
	Difference	▲			▲	

Standard errors are reported between brackets

▲ *for postive trend / difference*

◆▶ *for no change / difference*

▼ *for negative trend / difference*

Nationwide there was a significant gap between the performance of pupils in registered schools compared to satellite schools in both English and Mathematics (see Table 5.1). Pupils in registered schools outperformed pupils in satellite schools. The difference was moderate for both English and Mathematics. While pupils in registered schools improved significantly in English (small change) and Mathematics performance (large change) between 2012 and 2015, pupils in satellite schools only improved in Mathematics performance (moderate change). This finding suggests an increasing gap in performance between pupils from registered schools and from satellite schools. However, the following section shows that this apparent trend is explained by changes in urban and rural areas rather than by changes in registered and satellite schools.

Table 5.2 presents a closer look at the performance of pupils in registered and satellite schools within urban and rural areas. Two to three per cent of pupils in urban areas attended satellite schools and just over 10 per cent in rural areas. In both urban and rural areas pupils in registered schools outperformed pupils in satellite schools for both English and Mathematics. However, as Figure 5.1 shows, the difference in English performance was large in urban areas and small in rural areas, because pupils at registered schools in rural areas performed relatively low (at a similar level as pupils from satellite schools in urban areas). In urban areas, pupils from both school types improved in English performance between 2012 and 2015, but in rural areas they did not.

Table 5.2: Mean performance by school type and location in 2012 and 2015

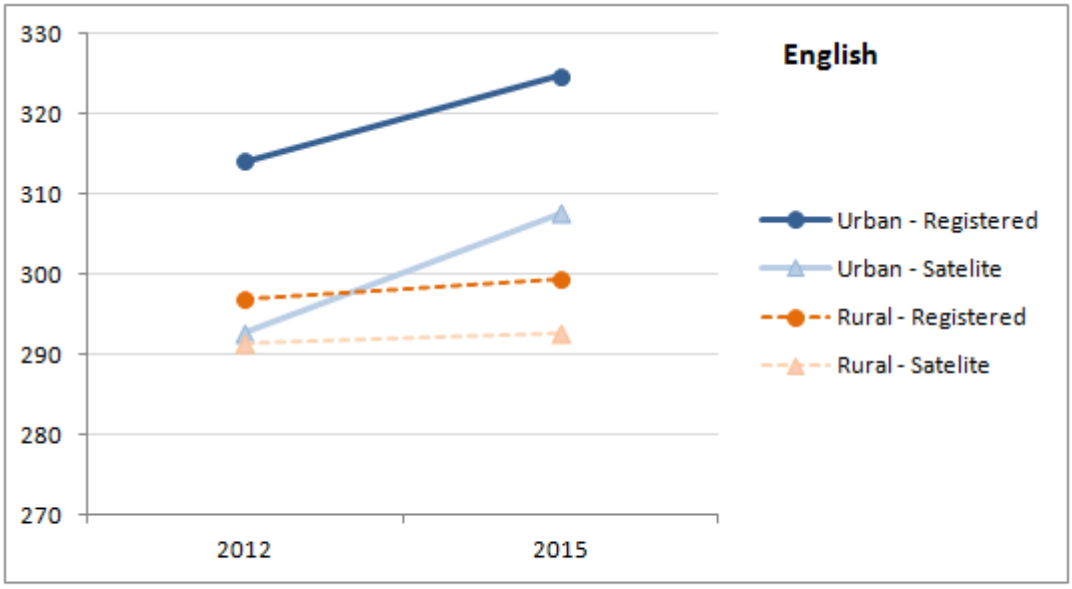
URBAN AREAS		Registered			Satellite	
Percentage	2012	97	(1.9)		3	(1.9)
	2015	98	(0.6)		2	(0.6)
English	2012	314.1	(2.83)	▼	292.8	(2.23)
	2015	324.8	(1.86)	▼	307.6	(4.47)
	Difference	▲			▲	
Mathematics	2012	311.6	(2.19)	▼	297.1	(5.87)
	2015	325.8	(1.39)	▼	315.7	(4.10)
	Difference	▲			▲	
RURAL AREAS		**Registered**			**Satellite**	
Percentage	2012	90	(0.5)		10	(0.5)
	2015	87	(0.6)		13	(0.6)
English	2012	297.0	(1.15)	▼	291.3	(0.92)
	2015	299.4	(0.97)	▼	292.5	(1.01)
	Difference	◂▸			◂▸	
Mathematics	2012	297.5	(1.19)	▼	293.1	(1.12)
	2015	309.2	(0.71)	▼	303.7	(0.95)
	Difference	▲			▲	

Standard errors are reported between brackets

▲ *for postive trend / difference*

◂▸ *for no change / difference*

▼ *for negative trend / difference*



Broken line for no change

Solid line for significant change

Figure 5.1: Mean performance in English by school type and location in 2012 and 2015

Results for Mathematics were similar as for English (see Figure 5.2), with the exception that pupils in both school types improved between 2012 and 2015 in rural as well as urban areas. The

improvement was large in urban areas for both school types and moderate in rural areas for both types.

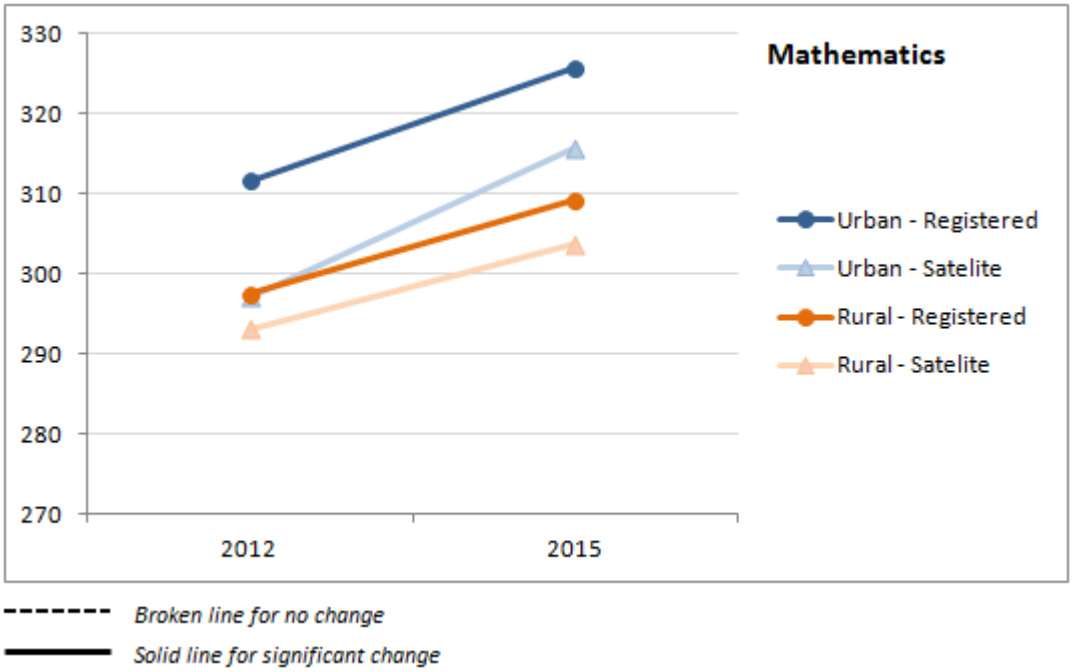


Figure 5.2: Mean performance in Mathematics by school type and location in 2012 and 2015

Interestingly, these results by urban and rural location show that the seemingly increasing gap between registered and satellite schools was actually explained by an increasing gap between urban and rural areas. Within these areas, the difference between registered and satellite schools remained stable over time.

School facilities

School heads were asked about their school's access to water (piped, tank or spring) and electricity (mains, generator or solar). Approximately 40 per cent of the schools had access to both water and electricity, but almost 30 per cent of the schools had no access to either.

The results in Table 5.3 show that pupils in schools with access to both electricity and water performed better in English and Mathematics than pupils attending schools with access to only one of the two. In addition, pupils attending schools with water and electricity showed improvement in performance between 2012 and 2015. The difference was moderate for English and large for Mathematics. In contrast, Grade 3 pupils attending schools without water and/or electricity did not improve in English performance, but they did improve in Mathematics performance.

Table 5.3: Mean performance in schools with and without electricity and water in 2012 and 2015

		Electricity and water		Either electricity or water		No electricity and no water	
Percentage	2012	43	(3.6)	28	(3.4)	29	(3.4)
	2015	39	(2.4)	32	(2.5)	29	(2.2)
English	2012	308.1	(2.64) ▼	295.0	(1.18) ▼	291.3	(1.33)
	2015	316.2	(1.49) ▼	298.0	(1.31) ◆	295.4	(1.18)
	Difference	▲		◆		◆	
Mathematics	2012	306.6	(2.27) ▼	296.2	(1.45) ◆	292.6	(1.68)
	2015	320.8	(1.03) ▼	308.0	(1.16) ◆	306.0	(0.95)
	Difference	▲		▲		▲	

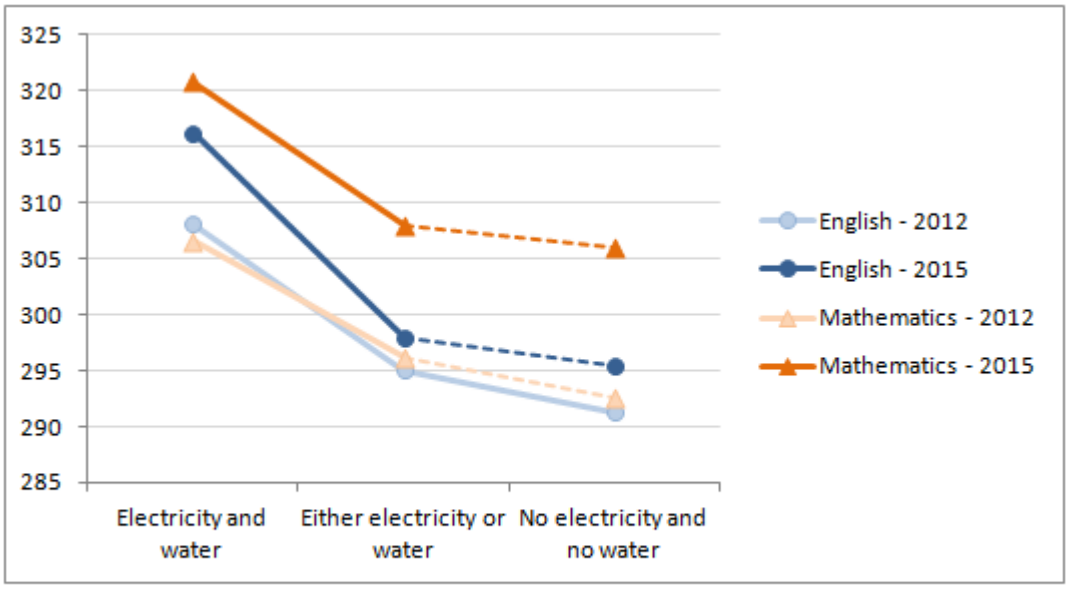
Standard errors are reported between brackets

School data is missing for more than one third of the pupils in 2012

▲ *for postive trend / difference*

◆ *for no change / difference*

▼ *for negative trend / difference*



Broken line for no change

Solid line for significant change

Figure 5.3: Mean performance in schools with and without electricity and/or water in 2012 and 2015

In addition to access to water and electricity in the schools, the proportion of permanent classrooms out of all classrooms, including temporary and open air classrooms, was related to pupils' performance (see Table 5.4). About one third of the pupils (34% in 2012 and 2015) attended schools with only permanent classrooms and about one quarter of the pupils (25% in 2012 and 28% in 2015) attended schools with less than two-thirds of permanent classrooms.

Pupils in schools with all permanent classrooms did not perform better than pupils in schools with at least two-thirds of permanent classrooms. In English, pupils in schools with more than two-thirds permanent classrooms also did not perform better than pupils in schools with less than two-thirds permanent classrooms, but in Mathematics they did. While not reported in Table 5.4, the differences

in performance of pupils in schools with all permanent classrooms did outperform pupils attending schools with less than two-third of permanent classrooms. The differences were small but significant.

Table 5.4: Relationship between pupil performance and proportion of permanent classrooms in schools in 2012 and 2015

		All permanent classrooms		At least two-thirds, but not all		Less than two-thirds
Percentage	2012	34 (3.3)		40 (3.8)		25 (3.3)
	2015	34 (2.9)		37 (2.7)		28 (2.3)
English	2012	302.2 (2.62)	⇹	298.6 (2.31)	⇹	295.5 (1.30)
	2015	306.8 (1.98)	⇹	306.1 (1.10)	▼	299.6 (1.59)
	Difference	⇹		▲		⇹
Mathematics	2012	302.1 (2.18)	⇹	298.1 (2.24)	⇹	296.7 (1.60)
	2015	313.6 (1.51)	⇹	313.8 (0.83)	▼	309.4 (1.22)
	Difference	▲		▲		▲

Standard errors are reported between brackets

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

These relationships between school facilities and performance are not necessarily causal relationships (see also Box 1.2). While access to water and electricity and permanent classrooms are likely to help teachers in their teaching and pupils in their learning, other factors such as differences in school budget, in school educational resources and in family SES may explain part of the relationship. In other words, schools without water and/or electricity are often also schools with smaller budgets, less educational resources and families with lower socio-economic backgrounds, which could all affect pupils' learning outcomes. Results in the previous chapter confirmed that a lack of school facilities influenced teacher retention, which in turn affects learning outcomes. The concluding section of this chapter combines some of the main predictors into one model to examine their individual net effects.

School budget

One question in the school head questionnaire asked for the total annual budget for the school for the current financial year. The instruction was included that the total annual budget referred to all of the funds received by the school throughout the financial year, including government funding, grants, school fees and any other funds received to fund the operation of the school. In order to make the budget comparable across schools, the total budget was divided by the school size to create an index for the size of the budget per pupil.

By exploring the distribution of this index and consulting with the ZIMSEC research team, three groups were created: schools with more than US$60 per pupil (large budget), schools with US$30 to US$60 per pupil (medium budget) and schools with less than US$30 per pupil (small budget). Half of the urban schools had a large budget in 2012, increasing to three quarters of the urban schools in 2015. In contrast, only one in six schools had a large budget in rural areas. Other percentages are included in Table 5.5.

Table 5.5: Relationship between mean performance and budget per pupil within urban and rural areas in 2012 and 2015

URBAN AREAS		More than $60		Between $30 and $60		Less than $30	
Percentage	2012	48	(6.7)	17	(5.5)	36	(6.5)
	2015	75	(3.6)	14	(2.8)	12	(2.3)
English	2012	318.2	(4.81) ▼	296.5	(4.61) ▲	308.4	(3.70)
	2015	325.6	(2.39) ◆	320.0	(3.55) ◆	322.0	(2.02)
	Difference	◆		▲		▲	
Mathematics	2012	315.7	(3.55) ▼	298.3	(4.93) ◆	306.9	(4.46)
	2015	326.2	(1.74) ◆	323.2	(2.53) ◆	324.7	(1.48)
	Difference	▲		▲		▲	
RURAL AREAS		More than $60		Between $30 and $60		Less than $30	
Percentage	2012	16	(3.0)	33	(3.7)	51	(3.6)
	2015	15	(2.7)	51	(3.9)	33	(3.5)
English	2012	305.2	(3.15) ▼	293.6	(1.68) ◆	293.2	(1.27)
	2015	305.7	(3.64) ▼	297.3	(0.79) ◆	296.7	(1.37)
	Difference	◆		◆		◆	
Mathematics	2012	306.0	(2.62) ▼	294.8	(1.37) ◆	293.7	(1.71)
	2015	313.3	(2.57) ▼	307.4	(0.76) ◆	307.8	(1.12)
	Difference	◆		▲		▲	

Standard errors are reported between brackets

School data is missing for more than one third of the pupils in 2012

▲ *for postive trend / difference*

◆ *for no change / difference*

▼ *for negative trend / difference*

Average performance in English and Mathematics for each of the groups in 2012 and 2015 is recorded in Table 5.5 and graphically displayed in Figure 5.4 and Figure 5.5. The irregular pattern for the relationship between performance and budget in urban areas in 2012 (the light blue lines), suggests that the data may have some inaccuracies. Both the questions for school budget and school size were open ended questions and the school head had to write down the values. These question types are generally prone to typos and data entry errors. Despite these irregular results in 2012, the general patterns in the figures show that pupils in schools with large budgets achieved higher than pupils in schools with medium budgets, in both urban and rural areas. This difference was smaller in 2015 than in 2012. Pupils from schools with a medium budget did not outperform pupils from schools with a small budget.

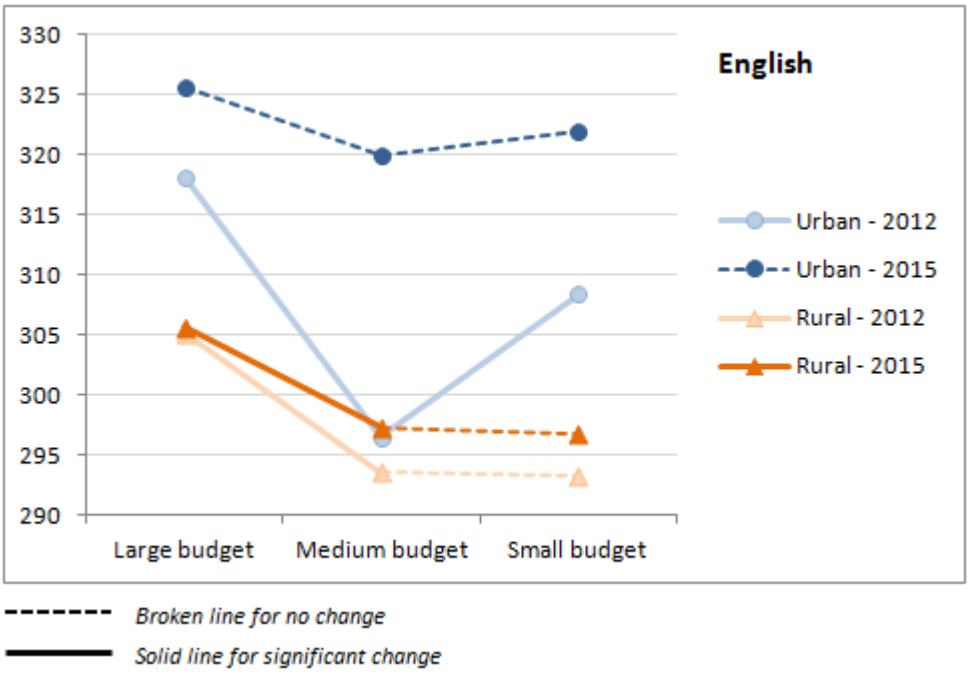


Figure 5.4: Relationship between mean English performance and budget per pupil within urban and rural areas in 2012 and 2015

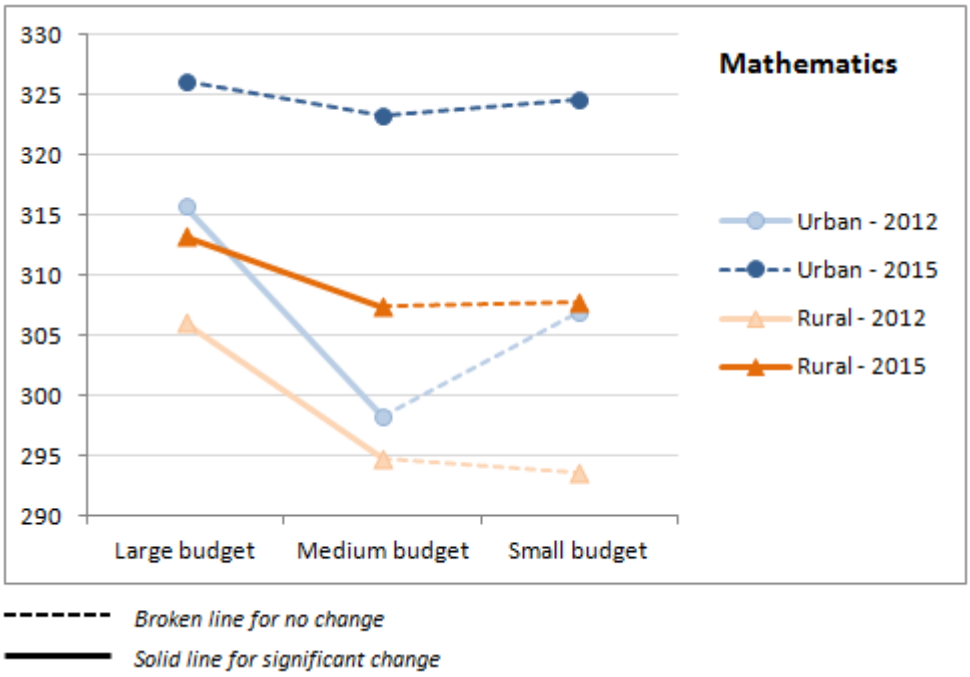


Figure 5.5: Relationship between mean Mathematics performance and budget per pupil within urban and rural areas in 2012 and 2015

Distance to district centre

The final school characteristic explored in this chapter is the distance between the school and the district centre. In the case study results described in the previous chapter, school location and consequent accessibility or inaccessibility was seen to impact on teacher retention or attrition, supervision and staff development. Since the distance to the district centre is often larger in rural areas than in urban areas and because performance is strongly related to these locations, the

analyses were performed for urban and rural areas separately. In urban areas, the majority of pupils went to schools that were less than 20 kilometres from the district centre, while in rural areas just under half of the pupils attended to schools more than 60 kilometres from the district centre.

Table 5.6: Relationship between mean performance and distance to the district centre within urban and rural areas in 2012 and 2015

URBAN AREAS		20 km or less		Between 20 and 60 km		More than 60 km	
Percentage	2012	71	(5.9)	10	(4.4)	19	(6.0)
	2015	86	(5.7)	10	(5.1)	4	(2.5)
English	2012	317.8	(5.26)	312.2	(5.48)	297.4	(4.40)
	2015	325.9	(2.53)	311.6	(6.13)	326.3	(15.22)
	Difference	⇹		⇹		⇹	
Mathematics	2012	314.6	(3.75)	310.9	(5.51)	298.0	(4.95)
	2015	326.8	(1.75)	315.7	(5.18)	325.0	(10.80)
	Difference	▲		⇹		▲	
RURAL AREAS		20 km or less		Between 20 and 60 km		More than 60 km	
Percentage	2012	18	(2.6)	37	(3.2)	46	(3.7)
	2015	17	(2.7)	43	(3.1)	40	(3.0)
English	2012	306.4	(4.41)	294.3	(1.06)	291.6	(1.08)
	2015	303.6	(2.72)	299.7	(1.54)	294.7	(0.98)
	Difference	⇹		▲		⇹	
Mathematics	2012	305.8	(4.96)	295.5	(1.35)	292.6	(1.07)
	2015	311.9	(2.30)	310.0	(1.08)	305.2	(0.90)
	Difference	⇹		▲		▲	

Standard errors are reported between brackets

School data is missing for more than one third of the pupils in 2012

▲ *for postive trend / difference*

⇹ *for no change / difference*

▼ *for negative trend / difference*

As presented in Table 5.6 performance was not related to the school's distance from the district centre urban areas. However, in rural areas a moderate difference was found in 2012 between schools less than 20 kilometres from the district centre and schools between 20 and 60 kilometres from the district centre. In 2015, this difference was not significant. However, a small difference in performance was found in 2015 between pupils attending schools between 20 and 60 kilometres from the district centre and pupils attending schools more than 60 kilometres from the district centre. This relationship between performance and school's distance to the district centre in rural areas is also displayed in Figure 5.6.

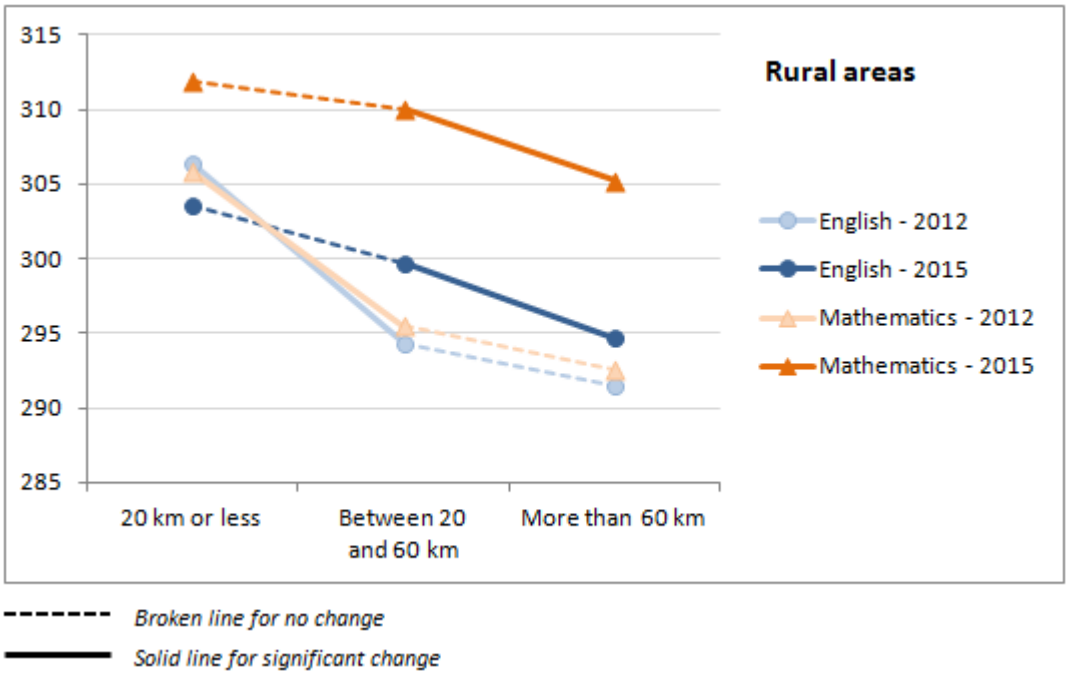


Figure 5.6: Relationship between mean performance and distance to the district centre within rural areas in 2012 and 2015

Teaching and learning opportunities

Regarding teaching and learning opportunities, the relationships between the number of textbooks per pupil and pupil performance and between the number of textbooks procured through the EDF and pupil performance were examined. Other factors concerning teaching and learning opportunities were the proportion of teachers with a teaching qualification and the number of days pupils were absent from school in the term when the assessment took place. The relationships of these two factors with pupil performance were explored.

Textbook-pupil ratio

The head teacher was asked to provide the total number of textbooks in the schools. To make the variable comparable across schools, this number was divided by the number of pupils attending the schools. The questions were not specifically about Grade 3 and it is possible the ratio of textbooks per pupil varies across grades. The pupils of each assessment were divided into three equally sized groups according to the number of textbooks per pupil in their school. The group with a high ratio had a median of seven textbooks per pupil; the group with a medium ratio had a median of five textbooks per student; and the group with a low ratio had a median of three textbooks per pupil.

The results in Table 5.7 indicate that there was no relationship between the number of textbooks per pupil and performance in English or Mathematics. Since the head teacher could have made errors in both the number of pupils attending schools and in estimating the number of textbooks in a school, this variable may not be very accurate. Maybe asking pupils how many textbooks they had per subject would have been a more direct way of collecting this information. It is also possible that no relationship was found because textbooks were photo copied and distributed page by page to the pupils, in which case only one or a few textbooks were sufficient for teaching many students. This information is not available.

Table 5.7: Relationship between mean performance and textbook-pupil ratio in 2012 and 2015

		High ratio		Medium ratio		Low ratio	
Median ratio	2012	7.3	(0.62)	4.8	(0.15)	3.5	(0.81)
	2015	7.1	(0.22)	4.9	(0.10)	3.0	(0.11)
English	2012	299.5	(2.02)	296.7	(1.40)	300.2	(2.64)
	2015	305.1	(1.63)	304.0	(2.06)	304.4	(1.49)
	Difference	⇔		▲		⇔	
Mathematics	2012	299.3	(1.85)	297.4	(1.71)	300.1	(2.32)
	2015	312.5	(1.18)	312.4	(1.52)	312.5	(1.15)
	Difference	▲		▲		▲	

Standard errors are reported between brackets

The three groups are equal in size within each assessment year

School data is missing for more than one third of the pupils in 2012

▲ *for postive trend / difference*

⇔ *for no change / difference*

▼ *for negative trend / difference*

EDF textbooks-pupil ratio

In 2015, school heads were asked how many of their textbooks were distributed as part of the EDF. The qualitative study revealed that his question was difficult to answer for some head teachers. They could not always remember well how many they received five years ago and some of the textbooks had disappeared over the years. This question was only included in the school head questionnaire since 2013, so this information was not available for the baseline study in 2012. To test if the pupils in schools with a larger number of EDF textbooks per pupil show more improvement than pupils in schools with less EDF textbooks, the results of 2015 were compared to the results of 2013 instead of 2012. Significant differences were unlikely to be found, because most change happened between 2012 and 2013.

The pupils were again divided into three equally sized groups according to the number of EDF textbooks per pupil in their school within each assessment year. According to the school heads' best estimates the schools with the highest ratio received around five textbooks per pupil, with a medium ratio around four textbooks per pupil and with the lowest ratio around three textbooks per pupil.

Table 5.8: Relationship between mean performance and EDF textbook-pupil ratio in 2013 and 2015

		High ratio		Medium ratio		Low ratio	
Median ratio	2013	5.3	(0.09)	4.3	(0.05)	3.3	(0.11)
	2015	5.5	(0.04)	4.1	(0.06)	2.6	(0.11)
English	2013	296.7	(1.27) ▲	305.8	(1.51) ⬌	307.4	(2.25)
	2015	299.4	(1.28) ▲	307.6	(1.71) ⬌	306.7	(1.70)
	Difference	⬌		⬌		⬌	
Mathematics	2013	304.6	(1.18) ▲	312.0	(1.49) ⬌	312.0	(1.59)
	2015	308.9	(1.06) ▲	314.8	(1.28) ⬌	314.2	(1.21)
	Difference	⬌		⬌		⬌	

Standard errors are reported between brackets

The three groups are equal in size within each assessment year

▲ *for postive trend / difference*

⬌ *for no change / difference*

▼ *for negative trend / difference*

The main finding was that pupils in schools with high ratios performed less well than the groups of pupils in schools with medium and low ratios. A plausible explanation is that poorer schools preserved more textbooks by hording them and preventing pupils from taking the textbooks home. None of the groups improved significantly in performance between 2013 and 2015. This is not surprising because most learning outcomes have remained the same after 2013. The results are also presented in Figure 5.7. It is possible that the group with high EDF textbook ratios improved more than the other groups since the baseline study in 2012, but this hypothesis could not be tested.

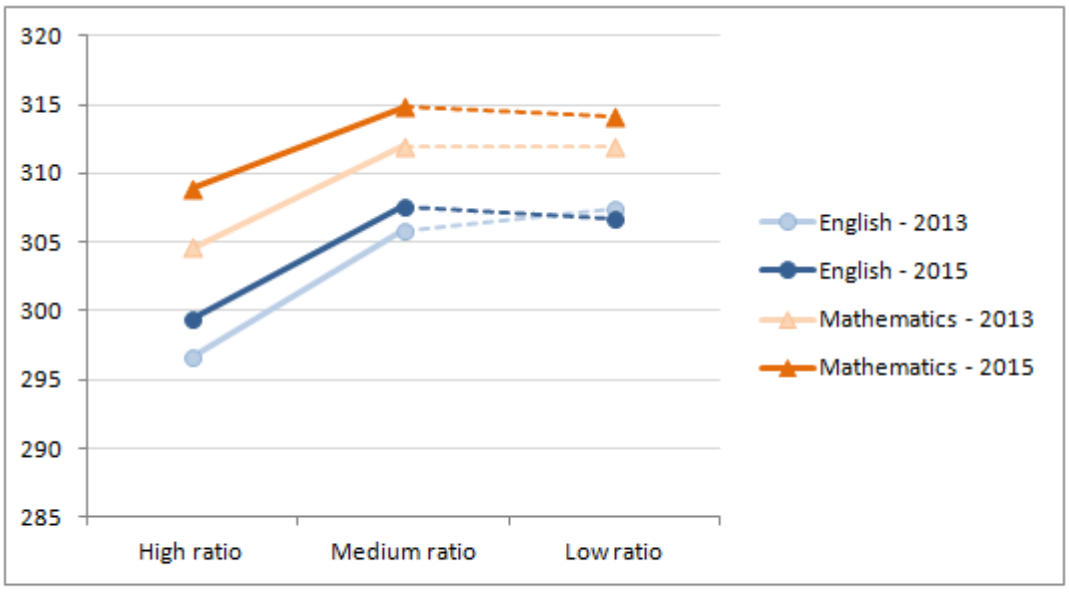


Figure 5.7: Relationship between mean performance and EDF textbook-pupil ratio in 2013 and 2015

Despite this apparent counter-intuitive finding, results from the previous chapter revealed that school heads and teachers of the case study schools were very positive about the EDF textbooks. In their

experience, the textbooks facilitated teaching and learning and decreased the financial burden on the families.

Proportion of qualified teachers

In both 2012 and 2015, about two thirds of the schools recorded that at least 90 per cent of their teachers had a teaching qualification. When dividing the sample in three groups of approximately the same size by the proportion of qualified teachers in the school, the group with the highest proportion recorded a proportion of 1.0, the group with a medium proportion around 0.9 and the group with the lowest proportion below 0.9.

Table 5.9: Relationship between mean performance and proportion of qualified teachers in 2012 and 2015

		High proportion		Medium proportion		Low proportion	
Median proportion	2012	1.00	(0.00)	0.95	(0.01)	0.63	(0.03)
	2015	1.00	(0.00)	0.93	(0.01)	0.80	(0.05)
English	2012	300.7	(1.98) ▲	308.9	(3.60) ▼	292.9	(1.79)
	2015	307.1	(1.50) ◆	309.9	(2.05) ▼	297.0	(1.35)
	Difference	▲		◆		◆	
Mathematics	2012	300.8	(1.86) ◆	307.1	(3.14) ▼	293.4	(1.77)
	2015	314.5	(1.12) ◆	316.2	(1.60) ▼	307.2	(1.13)
	Difference	▲		▲		▲	

Standard errors are reported between brackets

The three groups are equal in size within each assessment year

School data is missing for more than one third of the pupils in 2012

▲ *for postive trend / difference*

◆ *for no change / difference*

▼ *for negative trend / difference*

Pupils in schools in which all teachers had teaching qualifications (high proportion) did not perform better than pupils in schools in which around 90 per cent (medium proportion) of the teachers had teaching qualifications. This result either suggests that a small minority of teachers without a qualification did not affect student outcomes, or that the statement from school heads that all their teachers had teaching qualifications was not very accurate.

When comparing pupil performance in schools in which around 90 per cent of the teachers had teaching qualifications (medium proportion) with pupils from schools in which less than 90 per cent of the teachers had teaching qualification (low proportion), the latter group performed less well on both the English and Mathematics test in 2012 as well as 2015. Further exploration of the data showed that the proportion of qualified teachers generally decreases with increasing distance between the school and the district centre. This confirms the hypothesis stated before that it is difficult to attract and retain teachers in remote areas.

Days absent by pupils

Pupils were asked to report the number of days they had been absent in the term at in which the assessments took place. Almost 40 per cent of the pupils had not been absent at all and about a quarter of the pupils had been absent for three days or more. Table 5.10 reveals a clear relationship between performance and number of days absent from school. Pupils who had not been absent from

school performed better than pupils who had been absent for one or two days. In turn, pupils who had been absent for one or two days performed better than pupils who had been absent for three days or more. It is plausible that students who attend school more often have more opportunities to learn. However, similar to all results that are presented in this report, the relationship is not necessarily a causal relationship: pupils who miss more days at school are likely to be different from pupils who miss fewer days at school in many ways. For example, they may get less support from their families to do well at school, or they may come from less affluent families and need to work for the family, they may live in more remote areas where priorities may be different, and so on.

Table 5.10: Relationship between performance and number of days absent by pupil in 2012 and 2015

		No days		1-2 days		3 or more days	
Percentage	2012	39	(1.2)	34	(0.8)	26	(1.1)
	2015	39	(1.0)	35	(0.7)	26	(0.9)
English	2012	306.6	(1.41) ▼	298.0	(0.99) ▼	294.2	(0.94)
	2015	309.9	(1.28) ▼	302.2	(0.69) ▼	297.4	(0.78)
	Difference	◆▶		▲		◆▶	
Mathematics	2012	305.3	(1.28) ▼	298.4	(0.95) ▼	294.8	(1.04)
	2015	316.9	(0.93) ▼	310.9	(0.61) ▼	306.9	(0.69)
	Difference	▲		▲		▲	

Standard errors are reported between brackets

▲ *for postive trend / difference*

◆▶ *for no change / difference*

▼ *for negative trend / difference*

Explaining variance and change in performance

To conclude the analyses of this report, multivariate analyses were undertaken to examine the combined effects of the most important pupil and school variables on performance and, in addition, to test if any changes in these variables between 2012 and 2015 could explain the change in performance. As explained in Box 1.2 statistical relationships in this report cannot be interpreted as causal relationships. However, if we analyse multiple variables at the same time, we take the effect of other important variables into account when testing the relationship between one variable and performance. Therefore, relationships analysed within a multivariate model are more likely to reflect causal effects.

A multiple regression model was chosen to explain variance in English and Mathematics performance. The 2012 and 2015 data was pooled, so that the trend could be included as an effect (the difference in performance between 2012 and 2015). Blocks of explanatory variables were added to the model to explore changes in explained variance and changes in the trend. The purpose of this method will become clear when describing the results.

A variable was created to estimate the trend (value 0 for 2012 and value 1 for 2015). Four variables were included as indicator for socio-economic status (home possessions, number of meals per day, parental education, number of home educational resources); two for other pupil background variables (gender and number of hours of work for the family per day); location variables (urban versus rural and distance of the school to the district centre); teaching and learning variables (satellite versus

registered schools, budget per pupil per year, number of days absent in the current term, percentage of teachers with a teaching qualification).

Some pupils in 2012 and in 2015 did not have any valid values on either the pupil level variables or the school level variables. These students were removed from the analysis (40% of the pupils in 2012 and 6 per cent in 2015). These missing values were mostly caused by missing booklets of mismatching ID values. It was confirmed that the missingness was random. That is, pupils that were deleted from the analysis did not differ in average performance from pupils that were included in the analysis.

After removing these pupils, some variables had remaining missing values. If less than 4 per cent of the values were missing, the pupils with missing values were removed from the analysis. If more than 4 per cent of the values were missing (indicated in red font), their missing responses were replaced with the mode or the mean of that variable within that year and a dummy variable was added to indicate the missing value (value 0 for not missing and value 1 for missing), because skipping these questions in the questionnaire was assumed not to be random. The percentages of missing values per variable and the codes used for the variables are recorded in Table 5.11.

Table 5.11: Coding of explanatory variables and percentages of missing values

		Missing (%)	
Variable	**Codes**	**2012**	**2015**
TREND	0-1	0.0	0.0
SOCIO-ECONIMIC INDICATORS			
HOMEPOS	0-4	0.0	2.5
MEALS	0-2	1.1	4.9
PARED	0-3	15.3	11.1
HEDRES	0-4	0.0	1.3
BACKGROUND			
GIRL	0-1	0.0	1.6
WORK	0-3 hours	2.1	6.4
LOCATION			
URBAN	0-1	0.6	0.0
DISTANCE	10 km units (max 200 km	0.0	0.2
TEACHING AND LEARNING			
SATELLITE	0-1	0.0	0.0
BUDGET	$10 units (max $500)	1.9	0.8
ABSENT	0-3	4.1	0.6
TEACHQUAL	10% units	5.9	0.0

Table 5.12 shows the results of a multiple regression analysis explaining variance and trends in English performance. In the first model, only the trend was included as a predictor. The value is the difference in average performance between 2012 and 2015 (because 2012 was coded as 0 and 2015 as 1). This estimate is slightly different from the result presented in Chapter 2—where the difference was 4.2 points—because some pupils with missing values were removed from the current analysis (see previous paragraphs). While this difference was significant, the trend indicator did not explain a significant amount of variance in English performance between the pupils (R-square is not

significantly different from zero). That is, the average difference between the years was much smaller than the differences between individual pupils.

Table 5.12: Results of multiple regression analysis explaining variance and trned in English performance

		Model 0	Model 1	Model 2	Model 3	Model 4
	R-SQUARE	0.01 (0.01)	**0.17** (0.02)	**0.23** (0.02)	**0.24** (0.02)	**0.28** (0.02)
	TREND	**5.2** (1.48)	**4.1** (1.39)	**3.9** (1.23)	**4.2** (1.22)	**3.9** (1.24)
Location	URBAN		**17.3** (2.19)	**13.7** (2.39)	**13.5** (2.38)	**10.7** (2.23)
	DISTANCE		**-1.0** (0.16)	**-0.8** (0.14)	**-0.8** (0.14)	**-0.6** (0.13)
Socio-economic	HOMEPOS			**1.2** (0.37)	**1.3** (0.38)	**1.0** (0.34)
	MEALS			**2.4** (0.45)	**2.3** (0.44)	**2.2** (0.41)
	PARED			**3.4** (0.49)	**3.4** (0.49)	**2.9** (0.44)
	HEDRES			**2.5** (0.38)	**2.5** (0.38)	**2.1** (0.36)
Background	GIRL				**4.8** (0.34)	**4.8** (0.33)
	WORK				-0.1 (0.36)	0.0 (0.36)
Teaching and learning	SATELLITE					**-4.6** (1.22)
	BUDGET					**0.4** (0.13)
	ABSENT					**-1.9** (0.20)
	TEACHQUAL					**0.7** (0.21)

Note: Statistically significant effects are in bold

When adding the school location variables to the model—urban versus rural and distance between the school and the district centre—the trend decreases to a similar value as reported in Chapter 2. The reason for this is a methodological one. After removing pupils from the analysis because of missing values, 85 per cent of the pupils in 2012 and 72 per cent of the pupils in 2015 were from rural areas. In the full sample these percentages were 80 and 78, respectively. As a result, the average performance in 2012 was overestimated in Model 0 and the average performance in 2015 overestimated, because pupils in rural areas perform less well than pupils in urban areas. Model 1 takes this difference in rural distribution into account, which results in an unbiased trend estimate.

Both location variables predict English performance significantly. Pupils in urban areas perform on average 17 score points higher than pupils in rural areas, after taking the distance between the school and the district centre into account. In addition, for every 10 kilometres that a school is further removed from the district centre, pupils achieve on average 1 scale point lower in English. Together, they explain 17 per cent of all the variation in performance between the pupils over the two assessment years.

When adding the socio-economic background variables to the model (Model 2), the trend remained the same, meaning that changes in socio-economic status over the three years did not account for the increase in performance. However, the difference in performance between urban and rural areas decreased from 17.3 score points to 13.7 score points. This suggests that part of the difference in performance between rural and urban areas was explained by differences in socio-economic status of the families living in these areas, but not all, because the effect of location is still significant and large in Model 2.

All socio-economic indicators significantly predict performance. Every additional home possession item is associated with 1.2 score points increase in English performance, every meal with 2.4 score points, every additional parental school level (no school, primary school, secondary school and

tertiary education) with 3.4 score points and every home education resource with 2.5 score points. Together with the location variables, they explain 23 per cent of the variation in performance between pupils over the two assessment years.

In Model 3, two background variables are included that are not components of socio-economic status: gender and number of hours working for the family per day. Adding these two variables did not change the effects of the variables that were added in the previous models, meaning that they do not explain any of the previously described relationships. While girls perform better in English than boys by 4.8 score points, the number of hours students work for the family did not affect their performance on average. Table 2.15 showed that there was a difference in performance between pupils working more than one hour a day for their family and pupils who worked less, but these multiple regression results show that this difference disappeared when taking into account differences in family socio-economic status and school location.

In the final model, variables related to teaching and learning were included. While they did not explain the trend—that is, changes in these teaching and learning variables over time did not explain changes in performance over time—they did explain some of the location effects. Adding these variables to the model decreased the difference between rural and urban students and somewhat decreased the effect of distance to the district centre. In other words, when taking the number of satellite schools, the budget per pupil, the number of days a pupil was absent and the proportion of teachers with a teaching qualification into account, the difference in English performance between urban and rural pupils was not as large anymore. However, the difference between rural and urban areas, although smaller, remained significant after taking all these background and teaching and learning variables into account.

In addition, taking the effects of teaching and learning variables into account, also "softened" the effects of the socio-economic status indicators somewhat.

Each of the teaching and learning variables predicted English performance significantly (after taking differences in location, socio-economic status and gender into account). Pupils in satellite schools performed 4.6 score points lower than pupils in registered schools (note that the unadjusted difference was 9.4 score points in 2012 and 12.3 score points in 2015, see also Table 5.1); pupils performed on average 0.4 score point higher with every additional $10 per student per year; pupils performed 1.9 score points lower for every additional day they had been absent from school; and for every 10 percentage points more qualified teachers pupils performed on average 0.7 score points higher. All predictors included in Model 4 explained more than a quarter (28%) of the variation in performance between pupils in the two assessment years.

The results of the multiple regression models explaining Mathematics performance are presented in Table 5.13. While the trend is stronger for Mathematics, the pattern of the results was the same as for English. That is, changes in location, socio-economic status, gender and the included teaching and learning variables between 2012 and 2015 did not explain the increase in Mathematics performance. Furthermore, differences in family socio-economic status and included teaching and learning conditions explained a large part (almost half) of the difference between urban and rural areas and some of the difference between more and less remote schools. Teaching and learning conditions also seemed to soften the effect of socio-economic status somewhat. One difference

between the Mathematics and English model was that the proportion of qualified teachers did not significantly predict performance in Mathematics as it did in English.

Table 5.13: Results of multiple regression analysis explaining variance and trend in Mathematics performance

		Model 0	Model 1	Model 2	Model 3	Model 4
	R-SQUARE	**0.08** (0.01)	**0.17** (0.02)	**0.22** (0.02)	**0.23** (0.02)	**0.25** (0.02)
	TREND	**13.3** (1.32)	**12.4** (1.27)	**12.3** (1.13)	**12.7** (1.13)	**12.6** (1.15)
Location	URBAN		**11.8** (1.70)	**8.5** (1.79)	**8.4** (1.79)	**6.3** (1.71)
	DISTANCE		**-0.8** (0.13)	**-0.6** (0.12)	**-0.6** (0.12)	**-0.5** (0.12)
Socio-economic	HOMEPOS			**1.0** (0.30)	**1.1** (0.31)	**0.8** (0.29)
	MEALS			**2.6** (0.44)	**2.6** (0.44)	**2.5** (0.42)
	PARED			**3.3** (0.44)	**3.2** (0.43)	**2.9** (0.41)
	HEDRES			**2.3** (0.30)	**2.3** (0.30)	**2.0** (0.30)
Background	GIRL				**2.9** (0.36)	**2.8** (0.37)
	WORK				-0.3 (0.31)	-0.2 (0.30)
Teaching and learning	SATELLITE					**-3.0** (1.11)
	BUDGET					**0.3** (0.09)
	ABSENT					**-1.6** (0.20)
	TEACHQUAL					0.4 (0.20)

Note: Statistically significant effects are in bold

Conclusions

This chapter focussed on the relationships between pupil performance and characteristics of the school and learning environment. School type was strongly related to performance. Pupils from registered schools outperformed pupils from satellite schools. This difference was much larger in urban areas than in rural areas, because pupils from registered schools in rural areas performed relatively low (approximately equal to satellite schools in urban areas). Once the location was taken into account, the disparity between registered and satellite schools did not change over time. As described in Chapter 2, the difference in performance between urban and rural areas did appear to increase from 2012 and 2015.

Pupils attending schools with access to water and electricity performed better in English and Mathematics than pupils attending schools without water and/or electricity. This gap in English performance grew bigger between 2012 and 2015.

Analyses regarding the size of the school budget revealed that pupils in schools with a large budget (over US$60 per pupil) achieved higher than pupils in schools with a medium budget (between US$30 and US$60 per pupil), in both urban and rural areas. This difference was smaller in 2015 than in 2012. Pupils from schools with a medium budget did not outperform pupils from schools with a small budget (less than US$30).

In rural areas, pupil performance was generally negatively related to the distance of the school from the district centre. A plausible explanation for this relationship is the difficulty to attract and retain enough qualified teachers in areas further away from major towns or cities. This was confirmed by the findings that schools further away from the district centre generally had lower proportions of qualified teachers and that pupils from schools with lower proportions of teachers with teaching

qualifications (around 0.8 or lower) performed less well than pupils from schools with higher proportions of teachers with a teaching qualification (around 0.9 or higher).

A clear association was found between the number of days a student was absent and his or her performance in English and Mathematics. Generally, students who attend school less often have less opportunity to learn. However, none of the reported relationships are necessarily causal relationships. In this case, pupils who miss more days at school are likely to be different from pupils who miss fewer days at school in many ways. For example, they may get less support from their families to do well at school, or they may come from less affluent families and need to work for the family, they may live in more remote areas, and so on.

In the concluding analysis of this report, main predictors of performance were combined into one model to explain variance and change in performance. In such models it was possible to test the net effect of each predictor, taking differences in other predictors into account. The results revealed that changes in location, socio-economic status, gender and the included teaching and learning variables between 2012 and 2015 did not explain the increase in English or Mathematics performance. Furthermore, differences in family socio-economic status and included teaching and learning conditions explained a large part of the difference between urban and rural areas and some of the difference between more and less rural schools. Teaching and learning conditions also seemed to soften the effect of socio-economic status somewhat.

The fact that any changes between the assessment years in the included background or teaching and learning variables did not explain the increase in English or Mathematics performance suggests that the positive trends were caused by other factors. One plausible factor is the distribution of the EDF textbooks shortly before commencement of the ZELA project. However, we cannot rule out the effect of some small changes that were made to the link items between 2012 and 2013, so this could also explain part of the positive trend.

This chapter discussed the range of factors of an interactive learning system (Freeth & Reeves, 2004; Biggs, 1993) that could influence student learning outcomes. These results have important policy implications which will be discussed in the next chapter.

Chapter 6 - Conclusions, Policy Implications and Future Programming

The 2015 ZELA evaluation report provides an in-depth analysis of three major research questions over a four-year period that included a baseline cycle, two monitoring cycles and the final impact evaluation. These research questions are the following:

1. How do Zimbabwe pupils perform in the language and Mathematics tests? Is there a noticeable pattern of change over time?
2. What are the relationships of certain pupil, teaching and school variables with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe?
3. To what extent can improvement in test performance be attributed to the Education Transition Fund (ETF)?

Three hypotheses regarding the outcome of the intervention suggested by the analyses conducted in 2012 included:

1. An increase in average achievement over the time of the intervention
2. Smaller differences in performance between students subgroups according to their family background
3. A reduction in disparity between schools

The last two changes suggest more equitable opportunities to learn for all students.

Methodological Framework

Chapter 1 presented an organisational framework through the Biggs input-process-output model. Within this model data analysis of the pupil learning environment provides a framework that explains learning as an interactive system. Within this framework, learning-related factors are located at three points in time and include: presage, before learning takes place; process, during learning; and product, the outcome of learning (Biggs, 1993).

The analysis of pupil performance and relationships of school, teacher and pupil variables was located in Biggs' model focusing on two sets of presage factors: meta-contextual factors and those factors specific to the learner. In the adaptation of this model to datasets such as ZELA, the presage components are data about pupils, teachers, and school organisation and resourcing.

The Biggs model provides a structure to analyse influences upon learning opportunities where the purpose is to promote collaborative working; and, as such, critical analysis of possibilities for better-targeted management of educational processes (Freeth & Reeves, 2004). This model is capable of

generating predictions and associations that are relevant to this study and potential policy implications. Importantly, the key findings discussed in the following section provide evidence to inform policy implications for decision-making by education managers. Critical analysis of possibilities provide better-targeted management of educational processes through discussion of and reflection on lessons learned and potential for future programming as a result of the findings generated by ZELA.

The concluding comments in each chapter of this report emphasise how the Biggs model outlines the methodological framework for this study, and recognise that education is an interactive system. In particular, each chapter explored the pupil, teacher and school level variables that have the potential to impact student learning outcomes. The multivariate analyses undertaken in Chapter 5 examined the combined effects of the most important pupil and school variables on performance and, in addition, tested if any changes in these variables between 2012 and 2015 could explain the change in performance. Importantly, as explained in Box 1.2, statistical relationships in this report cannot be interpreted as causal relationships.

Review of the Key Findings

In addressing the above hypotheses, first, there has been an increase in average student achievement over the period of ZELA. Pupil performance in English and Mathematics has steadily increased between 2012-2015. Second, differences in family socio-economic status and included teaching and learning conditions explained a large part of the difference between urban and rural areas and some of the difference between more and less rural schools. Finally, the disparity between high and low performing schools was for a large part explained by the average socio-economic background of the families attending the schools. However, the proportion of this disparity that was explained by SES appeared to decrease between 2012 and 2015, which is another indication of growing socio-economic equity in education. This section reviews critical findings and each of the three major research questions below.

How do Zimbabwe pupils perform in the language and Mathematics tests? Is there a noticeable pattern of change over time?

The first question for this study explored how Zimbabwe pupils performed in assessments of language and Mathematics over time. The overall mean English performance increased by a small amount over 2012-2015, although the percentage of students at or above grade level did not increase during that period. However, a large increase was observed in mean performance for Mathematics, as well as an increase in the percentage of students at or above grade level between 2012 and 2015.

As with each year of ZELA, girls consistently outperformed boys in both English and Mathematics, but the difference was small. Pupils in urban areas performed better in both subjects than their peers in rural areas. The gap in English performance increased over time. In addition to this, there were large differences in pupil performance in English and Mathematics between provinces.

Pupils who were seven years old performed better than other age groups, and they were closely followed by pupils who were eight years old. A plausible explanation for the relationship between age and performance is the level of support given by the family for a child to attend school. Some children are required to work for the family, and often start school at a later age.

What are the relationships of certain pupil, teaching and school variables with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe?

The second major question for this research explored the relationships of certain pupil, teaching and school variables with performance on tests of language and Mathematics at the beginning of Grade 3 in Zimbabwe. The descriptive data suggested a small increase in home possessions, home educational resources and parental education.

As outlined in Chapter 3, socio-economic equity in education is defined as providing all students, regardless of socio-economic status with similar opportunities to benefit from education (OECD, 2013). ZELA analyses confirmed that there was a strong relationship between pupils' performance and their socio-economic background, and that the gap in performance between pupils from low and high socio-economic backgrounds decreased between 2012 and 2015. These results could be a sign of improved learning opportunities for all.

There is disparity between high and low performing schools, which was partly explained by the socio-economic background of families attending schools. A proportion of the disparity that was explained by socio-economic status appeared to decrease between 2012 and 2015. This is another possible indication of growing socio-economic equity since the distribution of textbooks provided under the EDF.

Chapter 4 explored the characteristics of low- and high-performing schools from the perspective of six different stakeholder groups: teachers, school heads, parents, DEOs, SDC members and pupils. These findings emerged from in-depth interviews and consultations at eight schools throughout Zimbabwe. The findings provide a snapshot of a range of educational contexts in Zimbabwe from the perspectives of people who engage with their schools, school communities and districts on a daily basis.

Those stakeholders who were consulted for the school case studies acknowledged that the initial distribution in 2010 of textbooks and resources benefited their schools in variety of ways. At the same time, there had been no additional distribution of resources and textbooks since 2010. Some schools had also lost textbooks, or needed textbooks in other subjects. A number of stakeholders interviewed also mentioned how low parent income and fee arrears affected schools. In other words, if people had more access to resources, funding and employment, many schools might better support the needs of their students and teachers. Adequate funding enables schools to maintain critical infrastructure, retain teachers and provide safe learning environments for pupils.

There is a well-established literature that explores the impact of family background on pupil learning outcomes. Comparable research carried out using the SAQMEQII and SACMEQIII databases indicated that access to more resources could imply greater opportunities for learning and more household support for learning.

Chapter 5 explored the interaction of a range of variables that were associated with pupil performance in English and Mathematics in the Zimbabwe educational context. In examining the educational characteristics of pupils, the data showed that nationwide in both English and Mathematics, pupils in registered schools significantly outperformed pupils in satellite schools. The findings also suggested an increasing gap in performance between pupils from registered schools and from satellite schools. However, this trend is more complex. Within urban and rural areas, the gap between registered and

satellite schools did not increase. In other words, the apparent increase in the gap between registered and satellite schools was explained by changes in urban and rural areas rather than by changes in registered and satellite schools.

While pupils from registered schools outperformed pupils from satellite schools, the difference was much larger in urban areas than in rural areas. Pupils from registered schools in rural areas performed relatively low - their performance was approximately equal to pupil performance in satellite schools in urban areas.

In rural areas, pupils' performance was generally negatively related to the distance of the school from the district centre. A plausible explanation for this relationship is the difficulty to attract and retain qualified teachers in areas further away from towns or cities. It was confirmed by the findings that schools further away from district centres generally have lower proportions of qualified teachers. The case study findings also suggested that school location and consequent accessibility or inaccessibility was seen to impact on teacher retention or attrition, supervision and staff development.

Pupils attending schools with water and electricity performed better in English and Mathematics than pupils without water and/or electricity. This gap for English grew bigger between 2012 and 2015. As emphasized in Chapter 5, the relationship between facilities and performance is not necessarily causal. Other factors such as differences in school budgets, school educational resources and family socio-economic status could be the explaining factors for this relationship.

Analyses regarding the size of the school budget and revealed that pupils in schools with large budgets performed better than pupils in schools with a medium budget in both rural and urban areas. This difference was smaller in 2015 than in 2015. However, pupils from schools with medium budgets did not outperform pupils from schools with small budgets.

The data showed that pupils who had not been absent from school performed better than pupils who had been absent for one or two days in a term. Those pupils, in turn, performed better than pupils who were absent for three or more days. It is plausible that students who are in school more have more opportunities to learn. However, as with all results presented in this report, the relationship is not necessarily causal. For example, pupils who are absent more may have less support from their families to do well at school, they may need to work for the family, or live in areas where priorities are different.

To what extent can improvement in test performance be attributed to the Education Transition Fund (ETF)?

Finally, the third major question for this study was the extent to which textbooks and resources distributed under the EDF had an effect on pupil performance. While no relationship was found between the total numbers of textbooks per pupil, a negative relationship was found for the numbers of EDF textbooks distributed by UNICEF in 2010. The most likely explanation for this result is that more EDF textbooks were sent to schools with lower performing pupils - for example, schools in rural areas, satellite schools, or schools with pupils from lower socio-economic backgrounds.

Despite this apparent counter-intuitive finding, results from the case studies revealed that school heads and teachers were very positive about the EDF textbooks. In their experience, the textbooks facilitated teaching and learning, and decreased the financial burden on the families.

The results from the multiple regression analysis in Chapter 5 revealed that changes in location, socio-economic status, gender and the included teaching and learning variables between 2012 and 2015 did not explain the increase in English or Mathematics performance. Furthermore, differences in family socio-economic status and included teaching and learning conditions explained a large part of the difference between urban and rural areas and some of the difference between more and less rural schools. Teaching and learning conditions also seemed to soften the effect of socio-economic status somewhat.

The fact that any changes between the assessment years in the included background or teaching and learning variables did not explain the increase in English or Mathematics performance suggests that the positive trends were caused by other factors. One plausible factor is the distribution of the EDF textbooks shortly before commencement of the ZELA project. However, we cannot rule out the effect of some small changes that were made to the link items between 2012 and 2013, so this could also explain part of the positive trend.

Policy implications

Tracking the evolution of these disparities over time can help the Zimbabwe school system monitor whether and how inequities in education opportunities and outcomes are growing or shrinking. Analysing and measuring these results has a number of policy implications, some of which are already being addressed in the school system in Zimbabwe. Based on the data, there are a number of implications that may impact future policy development.

A budget of at least US$50 or US$60 per student per year seems to be needed to make a difference. As discussed in the report and the review of critical findings, pupils at schools with larger budgets achieved higher than students at schools with medium to lower budgets. Furthermore, the effect of school budget on performance remained significant after taking effects of location, pupil socio-economic status, gender, working for the family, school type, absenteeism and proportion of qualified teachers into account.

Develop incentives for teachers to work in rural areas through improved teacher housing and school infrastructure, better salaries and consistent access to water and electricity. These variables were related to pupil performance. A number of stakeholders interviewed for the case studies suggested that improved infrastructure would improve teacher retention. Some teachers even suggested that they had plans to leave the school because of its inadequate infrastructure and housing, and ease of access to transportation and town or district centres. Lack of certified teachers has a flow-on effect for the quality of instruction, again resulting in a level on inequity in terms of the ability to achieve quality learning outcomes.

Provide incentives for students to attend school. These incentives could include a range of initiatives, for example improving infrastructure or educating families to support education. Some stakeholders interviewed for the case studies commented that students did not have enough food to eat. Further, data show that pupils who had three meals per day outperformed their peers who ate

fewer than three meals per day. There is some evidence that school feeding programs are related to educational quality and environment.[20]

Targeted school funding schemes in rural areas and for student from low SES backgrounds have the potential to address equity issues. The policy implication is to develop and continue supporting programs for disadvantaged pupils and families, in addition to improving conditions in rural areas. The multivariate model in Chapter 5 explored combinations of variables and their possible links to pupil performance. School location appears to have a significant relationship to pupil performance and this issue is linked to equity. The difference between rural and urban areas, although smaller, remained significant after taking all these background and teaching and learning variables into account. The multiple regression analysis also suggests that socio-economic indicators significantly predict pupil performance..

Develop programs or funding schemes for schools to replace textbooks and resources, or to purchase new textbooks or resources. While the quantitative data did not find direct relationships between pupil performance , the number of textbooks per pupil and the number of EDF-distributed textbooks per pupil, a number of stakeholders suggested that textbooks were very useful. It was also revealed that some textbooks had been lost, or they did not have textbooks in subjects that were not part of the 2010 EDF distribution. It is worthwhile exploring this issue further.

Understanding how a range of variables interact has important policy consequences. For example, if factors such as low teacher absenteeism and principal management of student progress characterise good schools (as suggested in analysis of SAQMEQII data), then steps need to be taken to provide these opportunities to schools where the majority of pupils may be performing below the national benchmark. This may be a combination of providing resources and funding, and supporting schools that are accountable and well-managed.

This 2015 evaluation report has provided a comprehensive analysis of the relationship of a range of school, teaching and pupil variables that are related to pupil performance in English and Mathematics at Grade 3. In particular, ZELA explored changes over time, especially in relation to equity. The analysis of trends over the four-year period of ZELA has the potential to enable policy-makers to make informed, evidence-based decisions about how to improve the learning outcomes of pupils in Zimbabwe, particularly at the primary level of schooling.

Lessons Learned and Future Programming

A critical aspect of this impact evaluation is to offer reflection on the lessons learned over the four-year period of ZELA, and how the substantial accumulated knowledge can be used in future programming. ZELA was designed as a four-year program to support and enhance national capacity to review and reform the system of pupil assessment in Zimbabwe. It established a baseline for the EDF program, and explored a range of factors related to pupil performance.

[20] See, for example, an Issues Paper produced by the World Food Programme (2004). *School feeding programs: Why they should be scaled up now*. Rome: WFP. Research published by SACMEQ III (Hungi, 2011) indicates that pupils who received school meals performed better, but were still the lowest performing pupils in nine out of 10 school systems in southern Africa. This finding indicates free meals were likely targeted to communities deemed to be disadvantaged economically.

ACER and ZIMSEC worked in partnership to administer, analyse and report on ZELA. ACER provided a range of capacity building workshops to support ZIMSEC's technical capacity in data analysis and assessment. During the final report writing workshop in September 2015, ACER and ZIMSEC colleagues reflected on lessons learned and knowledge developed over the four years of working together, and developed ideas for future programming. This section is based on those joint reflections.

Lessons Learned

In the national context, ZELA was the first instance that a national assessment of the early grades has been established over an extended period of time (2012-2015).

One lesson learned over that period of time is that it is possible to assess early grades pupils, for example as a baseline for further individual development from Grade 3, and not to simply have a first examination in Grade 7. Teachers and parents are interested in learning how pupils perform in school before Grade 7. One proposal is to make ZELA an ongoing national assessment (discussed in the following section), so that schools will know more about their pupils' learning outcomes.

- A large scale assessment program can be used to collect family background information of pupils and link those variables to pupil performance. In Zimbabwe, this kind of research had not been conducted until the initiation of ZELA in 2012.
- ZELA, as a national assessment, has provided an indication of pupil competencies at Grade 3 in English and Mathematics through described scales. Compared to national examinations, a national assessment provides evidence of pupil competencies.

A second lesson is that ZELA has developed a knowledge base for the Zimbabwe education system. ZELA has provided evidence to support decisions. While not the focus of this report, ZELA has supported capacity building for ZIMSEC in data analysis and continuous assessment. These activities have further supported the capacity of ZIMSEC to make evidence based decisions based on robust data.

- The use of Item Response Theory (IRT) enabled ZIMSEC to map performance and items on the cognitive instruments. This method enables education providers and policymakers to know what students know and how this information can inform the teaching and learning process. The use of IRT analysis should continue to be supported by ZIMSEC.
- ZELA has also established a comprehensive database of pupil, teacher and school level variables that may impact pupil learning outcomes. The use of this evidence can be used in developing policy and informing practice.

A third lesson is that a robust methodology had been designed and adhered to through the life of the program, but there is potentially room for improvement. ZIMSEC suggested that a teacher questionnaire could be included in any future survey. ZIMSEC also suggested that pupil questionnaires could be simplified. There was similarly a suggestion to include policy-related issues on future School head or teacher questionnaires. In hindsight, there were parts of the School head questionnaires that could have been improved in the following ways:

- Replace open ended questions by multiple response categories to simplify if appropriate. Instead of asking for an exact number, options can be provided to choose from with pre-defined ranges of values. For example, the question about the percentage of boys and girls who attend school regularly - with 'regularly' defined as 50 per cent of school days or more - is very difficult to understand and answer. It can be replaced with a simpler version that fits the purpose of the question.
- Reduce the length of questionnaires by removing questions that were not used for analysis (for example, the total number of boys and the total number of girls in the school); an explicit framework or analysis plan before developing a questionnaire often helps making these choices.
- The mixed methods methodology used in ZELA provided a more in-depth picture of the situation in Zimbabwe. Conducting in-depth interviews (qualitative) with the depth of statistics (quantitative) enables a more thorough investigation of why schools and pupils perform the way they do.

A fourth lesson was considering how a range of variables are potentially related to pupil performance. The workshop participants recalled factors such as:

- distance travelled by pupils to school
- teachers and teaching resources,
- variation between boys and girls in their performance in English and Mathematics
- local languages in teaching
- school location influencing performance

A large scale assessment program with cognitive and survey instruments has the potential to provide a roadmap to target the commitment of resources. A multiple regression model used in Chapter 5 was used to explain variance in English and Mathematics performance. Main predictors of performance were combined into one model to explain variance and change in performance. In such models it was possible to test the net effect of each predictor, taking differences in other predictors into account. Knowledge and analysis of such variables and their relationship to pupil learning outcomes has powerful potential to impact policy decisions.

A fifth lesson was a general consensus that human and financial resources are generally better in urban schools compared to rural schools. Urban schools are doing well compared to rural and satellite schools. The group contemplated what effort is ultimately needed for school infrastructure development in rural and satellite schools, how to improve budgets for those schools, and how to improve the process of teacher qualification in those schools.

A sixth lesson was the need for wider dissemination of findings, as well as a range of reports of ZELA findings. For example, the workshop suggested that findings could be disseminated in appropriate ways to a range of stakeholders including teachers, SDCs, school heads, DEOs, Provincial Education Officers, donors and Ministry staff. It was recognized that dissemination and reporting of findings had not been done in the first two years of ZELA. Perhaps these issues can be included in any future design of a national learning assessment.

Finally, ZELA has been located among other regional and international assessments. ZELA is the only ongoing national assessment in the Eastern and Southern African region; and, it is included as part of UNESCO's Institute of Statistics' *International Catalogue of Leaning Assessments*. ZELA's body of evidence fulfills the purpose of the UN Sustainable Development Goals (SDGs), by exploring the links between pupil performance and family and school variables. ZELA provides comprehensive data that can be used to address the targets identified as critical particularly under the SDG of ensuring inclusive and equitable quality education and promoting lifelong learning for all.

At the national level, there is potential for ZELA to be scaled up as an annual or biennial national assessment. Critically, ZELA can provide a model for developing assessments in other years of schooling (for example Grade 5 and Form 2). ZELA is a curriculum-based assessment and has the potential to provide an important source of evidence on pupil learning outcomes in Zimbabwe's new national curriculum.[21]

Future Programming

It is the recommendation of this evaluation that some form of ZELA be established as an assessment tool beyond 2015. The potential for the ZELA model to be used as a long-term monitoring program has been acknowledged by the Zimbabwe Ministry of Primary and Secondary Education (MoPSE) and ZIMSEC.

ZIMSEC has developed a proposal to continue and expand ZELA. The first component of the proposal is to continue ZELA whereby pupils at the end of Grade 2 (ZELA is administered in Term 1 of Grade 3) are assessed in languages and Mathematics. The other two components of the proposal are to expand the ZELA model to assess pupils in Grade 5 and in Form 2, in English and Mathematics at both levels.

Expanding the program will signal a shift from the monitoring and evaluation program funded for four years under the EDF to the development of a national assessment framework. Such a shift necessarily involves a rethinking of program focus. Key questions and issues around such a shift need to be considered. A national assessment program provides data important for policy reform, including how to target resources given evidence generated on student equity. An assessment program provides evidence for improving teacher preparation and professionalism, informing the curriculum review process, and developing local community support programs (as informed by data on student background).

ZELA has documented a number of achievements. These achievements include the monitoring and evaluation of Year 3 student learning outcomes nationwide over a four-year period and a significant capacity building program in IRT scaling and interpretation. In addition, it includes secondary data

[21] The Zimbabwe government formed the *Presidential Commission of Inquiry into Education and Training* (CIET) in 1998, and in 1999 published findings that recommended a major reform of the curriculum (UNESCO, n.d.). The *Zimbabwe Medium Term Plan 2011-2015* recommended a review of the curriculum, noting that a comprehensive review had not been conducted since 1986. The recommendation to update the curriculum was based on recognition of individual learner attributes, the needs of the economy and society, and challenges of the future (MOESAC, 2011). In 2014, the Ministry of Primary and Secondary Education (MoPSE) embarked upon a comprehensive curriculum review process to more effectively align with the education needs of Zimbabwe's population.

analysis using SPSS and interpretation of results, report writing and pilot research in school-based assessment. These achievements provide the groundwork for the expansion of a program like ZELA.

A range of issues have been discussed in regard to expanding ZELA. The following critical issues need to be addressed in supporting and developing such a program into the future:

- Given the current curriculum review (2015), will student competencies be based on the projected or the current curriculum?
- Will the tool(s) be skills based assessments if they are not linked to the curriculum? Will the tool(s) be curriculum-referenced, in that they measure students' skills?
- An identification of what is to be assessed needs to be clarified, for example, is student learning growth between grades a re-oriented focus of the ZELA?
- A national monitoring framework for assessment should be linked to MoPSE's sector plan.

Importantly, roles of ZIMSEC and MoPSE need to be clearly defined. For example, ZIMSEC has built substantial technical capacity in administering ZELA, collecting and capturing data, and is continuing to develop skills in IRT scaling, secondary analysis and report writing. An understanding of the roles of ZIMSEC and MoPSE will be a critical aspect in an expanded and ongoing program of national assessment.

A ZIMSEC position paper suggests continuing to use the method of drawing a national two-stage stratified sample of pupils at the identified grade levels. For ZELA Grade 3 (2012-2015), this sample was 500 primary schools. At the same time, a census-based population has also been discussed by stakeholders. A census-based population would have significant implications for an administration budget. However, it would likely have minimal impact on the cost of the development of an assessment framework, additional items, the design of the booklets, training, or the analysis of the data received.

The sample used also has an impact on the types of reporting available to stakeholders. Of course, a national census would allow reporting at school, classroom and student levels. Providing support in developing reports for schools and students would be an additional task, but this could have a powerful effect on building school/community linkages with the availability of student performance results.

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Appendix A: Pupil Questionnaire

Zimbabwe Early Learning 2014 Study Pupil Questionnaire

School ID ☐☐ – ☐☐☐

Pupil ID ☐☐☐

ZELA 2015 Pupil Questionnaire

Q1 What is the name of your school?
Please do not abbreviate it. Write it out in full.

_____

Q2 What is the name of the district your school is located in?

_____

Q3 What is your date of birth?
(Please write numbers in the boxes below.)

Day ☐☐ Month ☐☐ Year ☐☐☐☐

Q4 Are you a boy or a girl?
(Please tick only one box.)

(1) ☐ Boy

(2) ☐ Girl

Q5 Which language do you speak at home most of the time?
(Please tick only one box.)

- [ ] (1) Shona
- [ ] (2) Ndebele
- [ ] (3) English
- [ ] (4) Venda
- [ ] (5) Tsonga
- [ ] (6) Shangaan
- [ ] (7) Kalanga
- [ ] (8) Sotho
- [ ] (9) Ndau
- [ ] (10) Nambya
- [ ] (11) Other

Q6 What is your religion?
(Please tick only one box.)

- [ ] (1) Traditional African religion
- [ ] (2) Apostolic
- [ ] (3) Other Christian
- [ ] (4) Jewish
- [ ] (5) Muslim
- [ ] (6) No religion
- [ ] (7) Other

Q7 How many books are in your home?

(Please tick only one box. Do NOT count newspapers, magazines or school textbooks.)

(1) There are no books at home

(2) 1 book

(3) 2 to 5 books

(4) 6 to 10 books

(5) 11 or more books

Q8 What things can be found in your home?

(Please tick all that apply. If an item is broken at present but can be mended, tick the box.)

a) Electricity (mains, generator or solar)

b) Piped water

c) Television

d) Radio

Q9 What study materials do you have in your home?

(Please tick all that apply. If an item is broken at present but can be mended, please tick the box.)

a) Pencil

b) School bag

c) Pen

d) Desk at home

e) Computer

f) Calculator

Q10 How much time do you spend each day doing work for your family?

Work is paid or unpaid help you provide for your family. It could be chores at home or working in the family business.

(Please tick only one box.)

(1) Less than 1 hour

(2) 1 and more but less than 2 hours

(3) 2 hours and more but less than 3 hours

(4) 3 hours or more

Q11 How many meals a day do you usually have?
A meal refers to eating meat, vegetables and/or starch
(Please tick only one box.)

- ☐ (1) 1 meal
- ☐ (2) 2 meals
- ☐ (3) 3 meals or more

Q12 What Early Childhood Development (ECD) class did you attend?
(Please tick only one box.)

- ☐ (1) ECD A
- ☐ (2) ECD B
- ☐ (3) Both ECD A and ECD B

Q13 Who lives in your house?
(Please tick all that apply.)

- a) ☐ Father
- b) ☐ Mother
- c) ☐ Grandparent
- d) ☐ Aunty/Uncle
- e) ☐ Other guardian
- f) ☐ I do not have a guardian

Q14 What is the highest level of education of your mother (or female guardian)?
(Please tick only one box.)

- ☐ (1) Did not go to school
- ☐ (2) Completed some grades of primary school
- ☐ (3) Completed primary school
- ☐ (4) Completed some grades of secondary school
- ☐ (5) Completed secondary school
- ☐ (6) Started some tertiary study
- ☐ (7) Completed a tertiary course
- ☐ (8) I do not know
- ☐ (9) I do not have a mother or female guardian

Q15 What is the highest level of education of your father (or male guardian)?
(Please tick only one box.)

- ☐ (1) Did not go to school
- ☐ (2) Completed some grades of primary school
- ☐ (3) Completed primary school
- ☐ (4) Completed some grades of secondary school
- ☐ (5) Completed secondary school
- ☐ (6) Started some tertiary study
- ☐ (7) Completed a tertiary course
- ☐ (8) I do not know
- ☐ (9) I do not have a father or male guardian

Q16 How many days have you been absent from school this term?

☐☐ days

Q17 How many days have you been absent from school because you were caring for a sick family member?

☐☐ days

Q18 Have you ever stopped going to school for more than a term?

☐ (1) Yes

☐ (2) No

Q19 Where do you use the textbooks available to you at school?
(Please tick as many boxes as apply.)

a) ☐ In the classroom

b) ☐ In the library

c) ☐ At home

d) ☐ I do not use the school textbooks

e) ☐ Other *(Please tell us)* ☐

YOU HAVE COMPLETED ALL THE QUESTIONS.
THANK YOU VERY MUCH FOR YOUR TIME.

Appendix B: School Head Questionnaire

Zimbabwe Early Learning Monitoring 2014 School Head Questionnaire

School ID ☐☐ _ ☐☐☐

ZELA 2015 School Head Questionnaire

The information provided in this questionnaire should refer to the School Head, or the person taking on the Head's role (e.g. a Deputy School Head or Senior Teacher) if the Head is absent. **Your answers will be kept confidential.** They will be combined with answers from other principals to calculate totals and averages. No one school will be identified.

Position: School Head.
If not, please specify your position:

SOME QUESTIONS ABOUT YOU

Q1 What is the name of your school?
Please do not abbreviate it but write it out in full

Q2 What is the name of the district your school is located in?

Q3 What is the highest professional qualification in Education you have attained?

(Please tick only one box)

- (1) Diploma or certificate in Education
- (2) Bachelor of Education degree
- (3) Masters of Education degree
- (4) Other

Q4 Please indicate the highest qualification you have attained in fields **other** than Education.

(Please tick only one box.)

- (1) I do not have a qualification outside of education
- (2) Diploma or certificate
- (3) Bachelor degree
- (4) Masters degree
- (5) Other

QUESTIONS ABOUT YOUR SCHOOL

Q5 Which languages are used for **classroom instruction** in the first three grades at your school?
(Tick all that apply.)

a) ☐ Shona
b) ☐ Ndebele
c) ☐ English
d) ☐ Venda
e) ☐ Tsonga
f) ☐ Shangaan
g) ☐ Kalanga
h) ☐ Sotho
i) ☐ Ndau
j) ☐ Nambya
k) ☐ Other

Q6 In what year was this school established? (When was it opened?)
(Please write the number in the boxes below. Estimate the year if you do not know the actual year.)

☐☐☐☐

Q7 How many kilometres is it by road from your school to the district centre?

☐☐☐ kilometres

Q8 Which of the following best describes your school?
(Please tick only one box.)

- ☐ (1) Rural
- ☐ (2) Urban Day
- ☐ (3) Farm/Resettlement
- ☐ (4) Mine
- ☐ (5) Other

QUESTIONS ABOUT YOUR TEACHERS

Q9 How many teachers are present in your school during this week?
Please write '0' for a particular category if there are no teachers in it

a)	**Male** permanent teachers	☐☐☐ teachers
b)	**Female** permanent teachers	☐☐☐ teachers
c)	**Male** contract teachers	☐☐☐ Teachers
d)	**Female** contract teachers	☐☐☐ teachers

Q10 How many of the teachers in your school have the following levels of formal education as their highest qualification?

*Please write the number in the boxes for <u>each</u> category. Please count <u>each</u> teacher in terms of **his/her highest qualification**.*
Please write '0' for a particular category if there are <u>no</u> teachers in it.

a)	O-level only	☐☐ teachers
b)	A-level only	☐☐ teachers
c)	Tertiary education	☐☐ teachers

Q11 How many of the teachers in your school have completed a **teaching** qualification?
Please write '0' if there are <u>no</u> teachers with a teaching qualification

.

☐☐☐ teachers

QUESTIONS ABOUT ENROLMENT

Q12 What is the total number of boys and girls enrolled in your school?
(Please write the number in the boxes for each category. Include all children who are enrolled, even if absent this week.)
Please write '0' if there are no boys or no girls at your school.

a) Boys ☐☐☐☐
b) Girls ☐☐☐☐

Q13 Of those boys and girls who are enrolled, how many attend school regularly?
Attendance should be considered regular when a pupil attends school the majority of school days (more than 50 per cent)
Please write '0' if none of the boys or none of the girls attend regularly

a) Boys ☐☐☐☐
b) Girls ☐☐☐☐

Q14 What is the total number of boys and girls in **Grade 3** in your school?
(Please write the number in the boxes for each category. Include all children who are enrolled, even if absent this week.)
Please write '0' if there are no Grade 3 boys or no Grade 3 girls at your school.

a) Grade 3 boys ☐☐☐☐
b) Grade 3 girls ☐☐☐☐

Q15 What is the total number of class groups (or classes) in your school?
(Please write the number in the boxes below.)

☐☐☐ class groups (or classes)

Q16 What is the total number of **Grade 3** class groups (or classes) (e.g. 3a, 3b, 3c…) in your school?
(Please write the number in the boxes below.)

☐☐ Year 3 class groups (or classes)

Q17 How many pupils in your school are orphans or vulnerable children?
(Please write the number in the boxes below.)

Please write '0' if there are no orphans or vulnerable children at your school.

☐☐☐☐ pupils

Q18 How many pupils in your school have a disability?

A disabled person is a person with a physical, mental or sensory disability, including a visual, hearing or speech functional disability, which gives rise to physical, cultural or social barriers inhibiting him or her from participation at an equal level with other members of society.

(Please write the number in the boxes below.)

a) ☐☐☐☐ Boy pupils

b) ☐☐☐☐ Girl pupils

SOME QUESTIONS ABOUT SCHOOL OPERATION

Q19 How many sessions per day operate in your school?

(Please Tick one box only.)

(1) ☐ One session

(2) ☐ Two sessions

Q20 What was the total number of teacher days lost through teacher absence in first term of this year?

*(Please write the number in the boxes below. Please write '0' if there were no teachers absent on **any** days this term. If two teachers were absent on the same day, this should be counted as two teacher days lost)*

☐☐☐ days

Q21 In your school last term, did things such as late start of term, organization of examinations, school festivals, national celebrations, etc. clash with teaching?
(Please Tick one box only.)

(1) ☐ No days were lost
(2) ☐ 1 day
(3) ☐ 2 days
(4) ☐ 3 days
(5) ☐ 4 days
(6) ☐ 5 days
(7) ☐ 6 to 10 days
(8) ☐ 11 to 20 days
(9) ☐ More than 20 days were lost

QUESTIONS ABOUT SCHOOL FACILITIES

Q22 How many permanent classrooms, temporary classrooms, and open-air teaching areas does your school have?
(Please write the number in the boxes for each type of teaching environment.)

- Permanent classrooms are completed classrooms that have been built using materials in compliance with approved specifications;
- Temporary classrooms include, for example, temporary/thatch roof, roof only, walls only;
- Open-air teaching areas are areas that have no floors, walls, or roofs and are usually located under a tree.

(Please write the number in the boxes for each category. Please write '0' if there are none).

a) **Permanent** classrooms ☐☐
b) **Temporary** classrooms ☐☐
c) **Open-air** teaching areas ☐☐

Q23 How many textbooks does your school have?
(Please write the number in the boxes below. Please write '0' if there were <u>no</u> textbooks.)

☐☐☐☐☐ Textbooks

Q24 How many of these textbooks were distributed by UNICEF as part of the Education Development Fund Programme?

					Textbooks

Q25 For which of the following activities does your school use textbooks?
(Tick all that apply)

a) ☐ Classroom instruction

b) ☐ Library work

c) ☐ Homework (allowing pupils to carry books home)

Q26 How many of each of the following types of sanitation facilities does your school have?
(Please put the number of each type of facility in the boxes. If your school has no flush toilets write '0')

a) Flush toilets			
b) Squat holes or pit toilets			
c) Other toilets			

Q27 How many of these toilets are disability appropriate toilets
(Disability appropriate toilets are toilets that are designed for use by pupils with a disability)

			Disability appropriate toilets

Q28 Does your school have...
(Please tick appropriate box for each item. Only tick if the item is in a usable condition.)

	Yes
a) Piped water, water tank or spring	☐
b) Electricity (mains, generator or solar)	☐
c) Landline telephone	☐

QUESTIONS ABOUT THE RUNNING OF THE SCHOOL

Q29 During the last three months, how many teaching staff in your school attended a programme of professional development?

(A programme of professional development here is a formal programme designed to enhance teaching skills or pedagogical practices. It may or may not lead to a recognised qualification. The programme must last for at least one day in total and have a focus on teaching or education.)

			teachers at your school

Q30 How many of the teaching staff attending professional development in the last three months, are Early Childhood Development, Grade 1 or Grade 2 teaching staff?

a) | | | | ECD teaching staff attended professional development

b) | | | | Grade 1 teaching staff attended professional development

c) | | | | Grade 2 teaching staff attended professional development

Q31 How many of your teaching staff have attended the Para-professional Teaching Upgrade Program?

The Upgrade Program is for para professional teaching staff who have not completed their O Level qualification.

			Para-professionals have been upgraded

Q32 How many pupils in your school are in fee arrears?

(Please write the number in the boxes below. Please write '0' if all pupils are up to date with their fee payments.)

				pupils

Q33 What is the total annual budget for your school for this financial year?

Total annual budget refers to all of the funds received by the school throughout the financial year, including government funding, grants, school fees and any other funds received to fund the operation of the school.

$											US Dollars

Q34 How many US Dollars were received by your school through the School Improvement Grants programme?

(Please write the total number of dollars received as part of the School Improvement Grant Programme. Please write '0' if your school did not receive a School Improvement Grant)

$											US Dollars

Q35 How did your school use School Improvement Grant Funds?
(Please tick all that apply)

a) ☐ My school did not receive this grant

b) ☐ Minor repairs

c) ☐ Reading materials and textbooks

d) ☐ OVC Levies

e) ☐ Teaching and learning materials

f) ☐ Other

Q36 Have you (or another Education manager at your school) attended financial management training as part of the School Improvement Grants program?

☐ (1) No

☐ (2) Yes

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

Appendix C: Theoretical framework

This chapter provides the theoretical framework for the research study and describes sources of data, how outcomes are to be measured, and the approach to the research.

The input–process–output model for data in the pupil learning environment is represented diagrammatically in Figure 0.1.[22] The entries in the boxes are illustrative. The framework is an adaptation of the 3P model of learning and teaching developed by Biggs (Biggs, 1999; Biggs & Moore, 1993), which portrays learning as an interactive system, identifying "three points of time at which learning-related factors are placed: presage, before learning takes place; process, during learning; and product, the outcome of learning" (Biggs, 1999). Biggs's model draws attention to two sets of presage factors: meta-contextual factors and those factors specific to the learner. In the adaptation of his model to datasets, the presage components are data about pupils, teachers, and school organisation and resourcing. This model is capable of generating predictions and associations that are relevant to this study and the policy questions most likely to be addressed by it. Reading from top to bottom, from input through process to output, the diagram portrays the storyline for an individual pupil or pupil cohort.

[22] Matters , G. N. (2006). *Using data to support learning in schools: students, teachers, systems* (Australian Education Review No. 49). Camberwell: ACER.

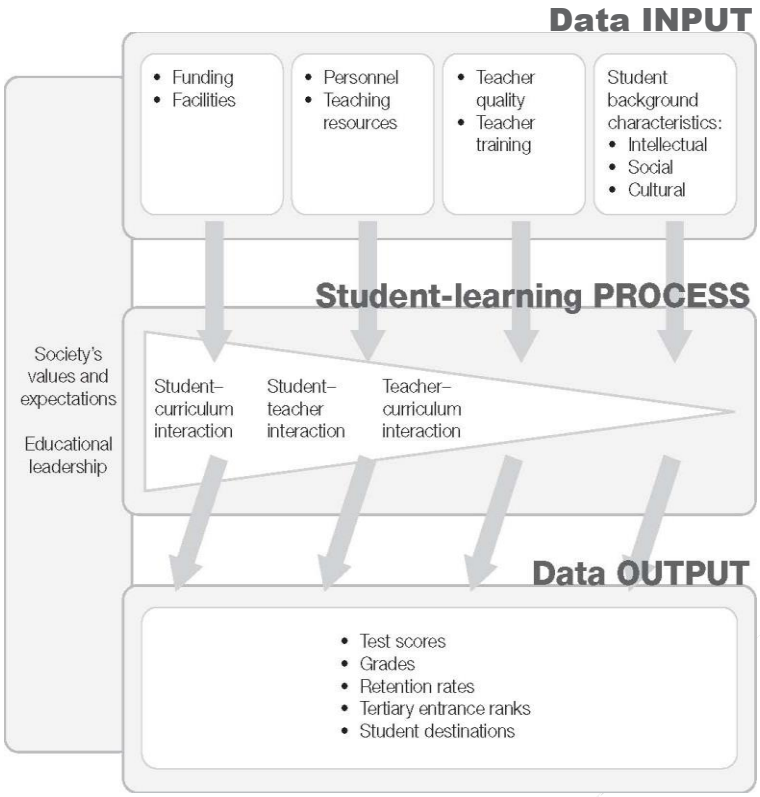

Figure 0.1: Input–process–output model for pupil data

A preliminary scan of reports[23] undertaken in early 2012 indicated that in Zimbabwe there was a severe shortage of teaching and learning materials and furniture in schools, most teachers needed professional development, and there was a significant proportion of orphans and vulnerable children in the population. Thus the study of the ETF program in Zimbabwe has gathered data about funding, facilities and resources, teacher quality and teacher training, and the pupils' backgrounds in both 2012 and 2013. **Error! Reference source not found.** lists the data that were gathered as inputs for the model. Items appearing in black indicate inputs for the model in 2012 and 2013. Items appearing in blue indicate inputs gathered in 2013.

Table C.1: Datasets – Input for Zimbabwe Study

Pupil level **(pupil background characteristics)**	**Teacher level** **(teacher quality and teacher training)**	**School level:** **Funding and facilities**
• Type of school attended • Age • Gender • Language spoken at home • No. of books in the home	• No. of teachers • Qualifications of teachers • Gender • Teacher absentee rate	• Province • School type • District • Language of instruction in the early years

[23] *Education at a Glance 2009.* Zimbabwe Ministry of Education, Sport, Arts and Culture, Summary of Cost and Financing of the Education Sector in Zimbabwe. February 2010, *Education Statistics: Zimbabwe.* UNICEF Division of Policy and Practice, Statistics and Monitoring Section, 2008, Nyanguru and Peil, 1991. *Zimbabwe Since Independence: A People's Assessment*. African Affairs, 1991, 90, 607–620.

• Infrastructure accessed by the home (electricity and water) • No. of hours/day working for family/community • No. of meals eaten per day • Access to Early Childhood Development class • No. of days absent in Term 1 • Access to resources to study in the home • Socioeconomic status (parental education level) • Religion • Caregivers living in the home • No. of days absent in Term 1 due to caring for an ill family member	• Professional development attendance • Qualifications of Head Teacher • Professional development attendance for teachers in the early years	• Years of operation • Proximity to a large city • Pupil population – enrolled • Grade 3 pupil population – enrolled • Average class size • Minutes per lesson • Sessions per day • No. of days of closure of school operations • School infrastructure • Wash facilities • Orphans and vulnerable children (%) • Funding • Pupils with chairs (%) • Textbook supply • Textbook use • Pupils in fee arrears (%) • No. pupils with a disability • School days lost for pupils with caring responsibilities • Head Teacher professional development attendance (school management)

Data outputs are pupil scores on a test of language (two subtests) and Mathematics (two subtests). **Error! Reference source not found.** provides an overview of these outputs.

Table C.2: Datasets – Output for Zimbabwe study

Subtest score: Operations	Subtest score: Application	Subtest score: Language	Subtest score: Comprehension
Score for Mathematics		Score for Language	