The First Year at School in the Western Cape: Growth, Development and Progress

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May 2017

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Executive Summary

This report describes the findings of the international Performance Indicators in Primary Schools (iPIPS) study in the Western Cape, South Africa. Assessments of children's development, behaviour and home background were conducted at the beginning and end of the first year of school with almost 3,000 learners in 112 schools. The aims of the study were to establish children's levels of development at the start of school and investigate the progress made during their first year of school. The first year of school is a crucially important phase of children's education and the findings from this study have implications for both practice and policy.

Key findings from the study:

- There was substantial variation in the learners starting Grade 1
    - They attended schools offering education in three different languages. Most were taught in the language they spoke at home
    - The modal age for starting Grade 1 was just over six and a half years but the ages varied from just over 5.5 to nearly 10 years; about 10% could have started Grade 1, a year earlier
    - Socio-economic backgrounds varied from one in 20 learners who came from households which had no tap water or electricity, to a similar proportion who had basic amenities plus an internet connection, TV and flushing toilet
    - A surprisingly high proportion of learners exhibited some behaviours (inattention, hyperactivity and impulsivity) associated with that of Attention Deficit Hyperactivity Disorder
    - The cognitive starting points varied dramatically.
- Cognitive starting points (reading, mathematics and vocabulary)
    - Most learners were ready for school; they had started their progress towards literacy and mathematics
    - Early reading: At the start of Grade 1 there was substantial variation in reading ability amongst learners. Most were able to identify some letters and many were able to read simple words. Some were just starting to understand what reading is and some were reading long passages
    - Early mathematics: Most learners started school able to identify numbers at least up to 10 and could carry out informal sums. Some were not yet able to count a few objects and the strongest were able to calculate a quarter of eight
    - The major influences on the cognitive starting points were socio-economic background, attendance at Grade R (Reception: the year before Grade 1) and Behaviour (inattention, hyperactivity and impulsivity).
- Surprisingly perhaps, the Quintile categorisation, a measure of socio-economic status of the location of the school used across South Africa as a basis for school funding decisions, proved to be weakly related to the detailed cognitive measures collected during this project
- Progress: Almost all learners made progress, in the sense that they gained higher or equal scores on the second cognitive test, although the progress was a little less than is seen in the UK

- Attainment at the end of the Grade 1 was most strongly linked to attainment at the start of school
- Progress varied from school to school
- The higher the score on the Behaviour scale, the slower the progress.

Implications

The Western Cape is characterised by a good educational infrastructure which is, in general, serving its Grade 1 learners well. The analyses provided in this report suggest that there are some actions which could be taken to enhance learning. Five suggestions follow:

- The most direct and immediate education action that could be taken is to increase the proportion of children attending Grade R.
- The second aspiration must be to bring all schools up to the same high standard as the best. By "best" we do not mean the highest attaining, as that is dictated by entry levels; rather the schools that made the most progress (value added) with their pupils. Such schools can be found in all Districts and amongst all three languages of instruction. We do not have a blueprint for this but see the starting point as an efficient monitoring system which can help identify the best.
- The third aspiration goes beyond the purview of educationalists; it is to follow up the high ratings for inattention, hyperactivity and impulsivity. Although these are subjective ratings, and we must be cautious about interpretations, they are very high. The higher the rating, the lower the initial cognitive scores of learners and the slower the progress during the first year at school. When put alongside the independent evidence for a high rate foetal alcohol syndrome in the Western Cape, it raises concern about the health of pregnant mothers.
- A requirement of the Nuffield award was that the assessments used during the project would, subsequently, be made "free at the point of use". With that in mind it is interesting to note that during three meetings with principals and teachers, there were spontaneous requests for access to the PIPS assessment so that the teachers can understand and help the learners at an early stage. It would be possible to provide an abbreviated version of iPIPS which would be paper-based and cost effective. This would be administered and analysed by schools across the Western Cape.
- Finally, we note that older learners tended to make slower progress and there is a concern that they will be drawn into other activities before they become fully literate or numerate. Some started school late and some were repeating the year but we are unable to quantify the numbers in each group. Successful efforts to get the 10% of older learners into school a year earlier should bear fruit.

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Acknowledgements

We express our thanks to the following, without whose help with this project and report would not have been possible:

- The Nuffield Foundation
- The Western Cape Education Department
- The Principals, teachers, learners and parents/guardians of the schools studied for this report
- Professor Lazarus Miti, Vice-Chancellor of the Eastern University Zambia
- Dr Michael Nettles, Senior Vice- President, Education Testing Service USA

1. Background

This report describes the main results from the international Performance Indicators in Primary Schools (iPIPS) study that was conducted in the Western Cape in 2016.

Internationally, iPIPS (www.ipips.org) is coordinated by the Centre for Evaluation and Monitoring (CEM) at Durham University in England. In South Africa, iPIPS is coordinated by the Centre for Evaluation and Assessment (CEA) at the University of Pretoria, South Africa. The CEA is the national coordinating centre for the International Association for the Evaluation of Educational Achievement's Progress in International Reading Literacy Study (PIRLS) focusing on grade 4 and 5 learners, which has monitored the progress of South African learners in Reading Literacy in the past decade: PIRLS 2006 (Howie, Venter, van Staden et al., 2009) PIRLS 2011 (Howie, van Staden, Tshele et al., 2012) and PIRLS 2016. These studies have revealed the very low performance of South African learners in reading in primary schools and provide a strong rationale for exploring learner's performance in the first year of schooling in this study.

The current project in the Western Cape is highly significant. From the perspective of the iPIPS international project, this study has provided the opportunity to ascertain the extent to which the assessment will work across all types of schools in the Western Cape with their variation in affluence, culture and language. Furthermore, it provides the chance to equate the assessments across languages of instruction and cultures and address the practical issues surrounding the administration of the tests as well as the nature and usefulness of the analyses and the reports.

From a national perspective, iPIPS provides an opportunity to explore the education system, providing valid and reliable data for a very important stage of schooling in a changing policy landscape. For nearly two decades, many learners in South Africa had no access to pre-schooling and therefore arrived in Grade 1 with few of the skills required for successful learning in that grade. Just three years ago, the government aspired to implement a Reception year (Grade R), the year prior to Grade 1, however, financial constraints resulted in an uneven realisation of this policy and the goal is to complete its full implementation by 2018.

Careful consideration was given to the selection of the research site to optimise the international and national opportunities. The Western Cape was chosen as it has a well-organised administration and the senior administrators were keen to host the project. Furthermore, despite being one of the higher performing provinces in terms of educational attainment in South Africa, the variation in performance across the province is significant and offers a good site to evaluate the effectiveness of the assessment system and its ability to provide valid and reliable data in a challenging context. With the Western Cape offering instruction in three South African languages (Afrikaans, English and isiXhosa), of which only two had previously been adapted for use in South Africa, there was a further opportunity to add an additional language (isiXhosa) to iPIPS' coverage internationally.

1.1 iPIPS

iPIPS (www.ipips.org) is an assessment of Grade 1 learners that is adapted and contextualised in each participating country. It was designed and developed in 1994, in England by Peter Tymms and further developed with Christine Merrell. The cognitive assessment within the system has very high reliability

and very good predictive validity in the UK context. To date, data have been collected from over three million pupils in more than a dozen countries over 20 years.

iPIPS is designed as a pre-test and post-test study, and administered to learners on a one-on-one basis by a trained assessor using a booklet with a tablet to capture the data. It is administered within the first few weeks of learners starting school to establish a baseline, and repeated at the end of that first year to monitor progress. Teachers are asked to complete some information about the learners' personal and social development and about their behaviour. Background information is also collected from teachers and parents/carers by the assessor about the learners' socio-economic status and some additional aspects of their home background.

Once data have been collected at the start of the academic year, feedback is given to schools. This is repeated at the end of the year when progress measures are provided. A detailed description of the content and adaptation of the assessment is given later.

1.2 Research questions

The project aimed to address the following questions:

1. What do children in the Western Cape know and what can they do when they start school?
2. How do the starting points vary by sub-groups including gender, language of instruction, home language, home background (socio-economic status) and attendance in Grade R?
3. How much progress is made in the first year?
4. How do the learners in the Western Cape compare with learners in England and Scotland?
5. What implications do these analyses have for policies in the Western Cape?

This report begins with a description of the methods used to prepare and to undertake the study, followed by a description of the instruments that were administered and the analysis conducted. The results and findings are given in relation to the research questions with the last question being addressed in the Conclusions after the findings are summarised.

A previous report gives more detailed information about the study results from the start of school (Howie et al., 2016). The key points from that report are summarised in what follows.

2. Preparation for baseline assessment

In this section, the adaptation and translation of the instruments is outlined, followed by a description of the sampling procedure for schools and learners.

2.1 Adaptation and translation of the instruments

iPIPS is administered in the language of instruction, which in the Western Cape is Afrikaans (a derivative of Dutch vernacular), English, and isiXhosa (an indigenous African language) in Grade 1. These three languages dominate the Western Cape: Afrikaans is spoken by about half (49.7%) of the population, isiXhosa by about a quarter (24.7%) and English by a fifth (20.7%). The remainder are split between more than 10 further languages including sign language (0.4%).

The instruments were first adapted for the South African context and translated into Afrikaans and isiXhosa. The Afrikaans translation was carried out without any problems as most of the instruments had been previously translated and implemented widely (Scherman, Archer and Howie, 2012). Although the instrument had previously been translated into other African languages, it had never been translated into isiXhosa.

isiXhosa is the second most widely spoken language in South Africa spoken by 16% of the population nationally. In the Western Cape, isiXhosa is the most widely spoken indigenous African language (Edwards & Ngwaru, 2011; Prah, 2007). isiXhosa was standardised previously by harmonising and elevating Gcaleka and Thembu out of more than six dialects[1] (SAHO, 2015). The standardised form, whilst being used for official purposes and in schools, is not always recognised by those speaking other dialects.

After initial translation into isiXhosa, it was back translated into English; this is considered a strong method for translating international comparative assessments (Martin and Kelly, 1996). The back translation was studied for inconsistencies against the original text. This was an iterative process with many translations, back translations and translation verifications. The main goal of the instrument is to gain a measurement of what the child knows regarding literacy and mathematics in the standard form of the language.

The aim was to establish equivalent versions in Afrikaans, English and isiXhosa where possible. The Afrikaans and English versions had undergone years of trialling and implementation in Gauteng in earlier years (Scherman, 2007; Archer, 2011) and therefore whilst the process was scientifically rigorous, it was not as intensive and extensive as the processes required for the isiXhosa version.

2.2 Sampling of schools and learners

The Western Cape Department of Education (WCED) provided the latest updated list of schools and learners within three school districts[2] of the province. The population of focus was the Grade 1

[1] There are 13 subgroups who speak a dialect of the isiXhosa language, including the isiMpondo (isiNdrondroza), Thembu, Bomvana, Mpondimise, Rharhabe, Gcaleka, Xesibe, Bhaca, Cele, Hlubi, Ntlangwini, Ngqika, Mfengu

[2] Initially two districts were selected but a third was needed in order to include sufficient numbers of isiXhosa schools in the sample

learners. The target population was those who attended schools in three districts in the Western Cape.

A two-stage stratified random sample was drawn using SPSS version 23 software. The first stage was to select schools within the explicit stratum of language of learning and teaching per district. A random sample of schools for each language was selected in each district. The second stage was to select learners across classrooms in Grade 1. A random sample of 25 learners per school stratified on gender was selected equally from all classrooms. The sample can be regarded as representative of Grade 1 learners in each of the three districts.

Ultimately, the intended sample comprised 120 schools across three districts and from these 112 (92%) schools were tested (see Table 1). The fieldwork team managed to carry out assessments in all the chosen Afrikaans schools, 86% of English schools and 95% of the isiXhosa schools. This rate for each language met all the international levels set by the International Association for the Evaluation of Educational Achievement (85%) (Gregory et al., 2001).

Table 1 Number of schools in intended and attained samples for Western Cape at the start and end of year

	District A		District B		District C		Total	
	Intended	Achieved	Intended	Achieved	Intended	Achieved	Intended	achieved
Afrikaans	13	8	13	19	13	12	39	39
English	14	14	14	8	14	14	42	36
isiXhosa	13	9	13	10	13	18	39	37
Total	**40**	**31**	**40**	**37**	**40**	**44**	**120**	**112**

The intended sample comprised 3,000 learners across the three districts (see Table 2). The fieldwork team attained 93% of the schools at the start of the year; an excellent rate for international studies. The international standards set by the International Association for the Evaluation of Educational Achievement are that 85% of schools needed to participate (IEA report, in press). The same schools were all involved in the data collection at the end of the year.

The proportion of the intended learners assessed at the start of the year was 90% (98% for Afrikaans schools, 85% for English schools and 87% for isiXhosa schools) which still met the international levels. Exactly why there were different response rates for the different groups is unclear. It could be cultural or it might simply be natural variations. Unfortunately, absenteeism has become an established but unofficial practice not only in Western Cape but nationally at the end of the year. During the year it is not much different. Some of the absenteeism seems to relate to parents trying to save transport money and apparently not seeing the value of schooling in the final month of school. The proportion retested at the end of the year was 92% overall (91% for Afrikaans schools, 96% for English schools and 91% for isiXhosa schools). Table 2 shows the number of learners who were assessed at the start of the year and retested at the end of the year. For details on how we treated missing data, see the section in the Appendix headed “Imputation and multi-level models”.

Table 2 Number of learners in intended and attained samples assessed at the start and end of year by language per district

	District A			District B			District C			Total		
	Intended	Start	End	Intended	Start	End	Intended	Start	End	Intended	Start	End
Afrikaans	325	204	178	325	428	397	325	324	292	975	956	867
English	350	358	336	350	188	172	350	375	354	1050	921	862
IsiXhosa	325	214	193	325	212	190	325	422	385	975	848	768
Total	**1000**	**776**	**707**	**1000**	**828**	**759**	**1000**	**1121**	**1031**	**3000**	**2725**	**2497**

A further sampling procedure was employed to collect data from teachers about children's personal and social development and behaviour. In order not to over-burden them, they were asked to complete forms for a randomly selected subset of learners from the original sample of learners. This was for five forms per teacher and 1,837 learners in total. More than 1,560 forms were returned; a response rate of over 80% (see Table 3).

3. The instruments and numbers of learners assessed

Table 3 shows the number of learners for whom data were collected at the start and end of the year.

Table 3 Number of learners for whom data were available as the start and end of year for Cognitive, Personal & Social Development and Behaviour by language

Language	Cognitive (start)	Cognitive (end)	Personal & Social Development (start)	Personal & Social Development (end)	Behaviour (start)	Behaviour (end)
Afrikaans	956	867	570	541	585	559
English	921	862	435	538	470	551
isiXhosa	848	768	465	408	497	453
Total	2725	2497	1470	1487	1552	1563

3.1 The iPIPS Assessment Content

Reading, mathematics, vocabulary and phonological awareness

The iPIPS assessment that was implemented in the Western Cape has more than 200 items designed to examine cognitive development. The questions are organised into a series of sub-assessments corresponding to the development of vocabulary, phonological awareness, reading and mathematics (Table 4). These have been shown to be predictive of later success in literacy and mathematics (Tymms, 1999; Tymms, et al., 2012). Schooling helps vocabulary and it in turn helps with reading and mathematics, whilst phonological awareness is particularly relevant to reading (Gathercole et al., 1992).

Table 4 Cognitive constructs used in iPIPS

Developmental Area	Sub-assessment	Description
Reading	Name Writing	The child is asked to write his/her own name and the quality of writing is scored.
Vocabulary	Vocabulary	Vocabulary – the child is asked to identify objects embedded within a picture.
Reading	Ideas About Reading	Ideas about reading – assesses many of the ideas found in Marie Clay's Concepts about Print. (Clay 1972)
Phonological awareness	Phonological awareness	Repeating Words - the child hears a word and is asked to repeat it. Rhymes – the child is asked to select a word which rhymes with another.
Reading	Letters	Letter identification – a fixed order of mixed upper and lower case letters.
Reading	Early Reading Word	Word recognition and reading. This starts with word recognition and moves on to simple sentences that the child is asked to read aloud. The words within these sentences are high frequency and common to most reading schemes. This is followed by a more difficult comprehension exercise which requires the child to read a passage and at certain points select one word from a choice of three that best fits that position in the sentence.
Mathematics	Ideas About Mathematics	Ideas about mathematics – assessment of understanding of the vocabulary associated with mathematical concepts.
Mathematics	Counting	Counting and numerosity – the child is asked to count four objects. These disappear from the screen and then the child is asked how many objects they saw. This is repeated with seven objects.
Mathematics	Digits	Digit identification – single, two-digits and three-digits.
Mathematics	Shapes	Identification of a variety of geometric shapes.
Mathematics	Number	Number manipulation – the child is asked how many more or less a number is than a target.
Mathematics	Sums A	(Informal) Sums – addition and subtraction problems presented without symbols.
Mathematics	Sums B	(Formal) More difficult mathematics problems including sums presented with formal notation.

For the analysis of the results, measures for the four main cognitive sections of the assessment (reading, mathematics, vocabulary and phonological awareness) were constructed using a statistical method called Rasch modelling based on data from the start of year. This technique transforms learner's raw scores into an equal interval scale, which can then be used to make direct comparisons between the difficulty of items and the abilities of the learners. These scales can be thought of as a measure like a ruler and the units of measurement are called Logits.

The difficulty of items can be plotted along the scale, rather like points on a ruler. Similarly, learner's ability on the assessment can be placed on the same ruler. This means it is possible to directly see the kinds of items which a child can answer correctly, those which are easy and those which are beyond their reach at the time of assessment. It allows us to set out what learners know and can do (Bond and Fox, 2001; Linacre, 2003; Andrich, 2004).

When constructing the scales, it was important to investigate whether items behaved differently in the different languages, i.e. were some items relatively more difficult or easier in one language compared to another? This is known as Differential Item Functioning (DIF).

The reading section included 97 items, of which 34 were relatively easier in one language version compared to another. In other words, these exhibited DIF and so were removed to leave a reading scale which was suitable for comparing groups of learners who were assessed with the different language versions of iPIPS. The newly constructed reading scale of 63 items had a person reliability of 0.73. We also checked for DIF by sex, age and quintile as well as for item fit but there was no need to remove any further items.

The mathematics section initially comprised 64 items. During the analysis, a number of items were excluded because they exhibited DIF between the three different language versions. No items were excluded for DIF across the sexes, ages and quintiles. No items were excluded because they did not fit the unidimensional scale. This left 42 items covering a wide range of difficulties. The scale had a person reliability of 0.78.

It was not possible to put learners, assessed in the three different language versions, onto the same vocabulary scale. Almost every item showed DIF between at least two of the language versions. Each language version is therefore treated separately and no attempt is made to compare the vocabulary levels. There were 30 items and the person reliabilities were 0.75, 0.82, and 0.64 for Afrikaans, English and isiXhosa respectively. Within each language version there was very little evidence of DIF by sex, age or quintile. A very small number of items were excluded from the analysis because everyone who was shown them either got them right or wrong.

Two sections, Repeats and Rhymes, were used to assess phonological awareness. The items did not work in an equivalent manner across the three language versions and, as with vocabulary, the scales for each language version are reported separately. There were eight items in the Repeats section and nine items in the Rhymes section. The two sections worked well together with the Repeats tending to separate out the less able learners and the Rhymes being more suited to the more able. The person reliabilities for phonological awareness were 0.69, 0.66, and 0.70 for Afrikaans, English and isiXhosa respectively. All items were used in each language version and there was little evidence of DIF by sex, age or quintile.

Personal and social development (PSD)

Teachers were asked to complete 11 items related to learners' personal social development and 18 items related to behaviour. The items for personal and social development, shown below, were rated on a five point scale:

- Upset: The child is upset at start of day and worried throughout the day
- Reliance: The child relies on others and needs help with clothing and personal activities (clothing, toilet, etc.)
- Confidence: The child's level of confidence and participation
- Concentration – teacher: The child finds it difficult to concentrate in teacher-directed activities
- Concentration – self: The child finds it difficult to concentrate in self-directed activities
- Impulsive: The child acts impulsively without consideration for themselves or others
- Communication – children: The child finds it difficult to communicate with other children and make friends
- Communication – adults: The child finds it difficult to communicate with adults

- Rules: The child takes no notice of rules and distracts others and interrupts activities
- Cultural: The child is aware of cultural differences
- Communication: The child's ability to communicate.

Behaviour

The 18 items related to behaviour were tightly based on the diagnostic criteria for Attention Deficit Hyperactivity Disorder (ADHD) published by the American Psychiatric Association (2000) Diagnostic and Statistics Manual (DSM IV). There are nine items related to inattention, six related to hyperactivity and three to impulsiveness. Teachers were asked to rate learners on a six-point scale (0 to 5) covering the range of never to always.

3.2 Home background (Socio-economic status)

A questionnaire for parents was developed to assess the home background (socio-economic status) of the learners. This comprised 13 questions regarding access to amenities such as running tap water, access to a car and resources that could assist a child's learning such as access to books, their own room and an internet connection. The items, which were used to form the scale described in section 4.1, were adapted from the South African scale used in Progress in International Reading Literacy Study (PIRLS 2016) *Possessions in the home.*

4. Profile of Learners

The next part of the report explores the Western Cape contextual variables and how learners vary when they start school. In order to contextualise the assessment results, four key background variables are used: language spoken at home, sex, age and socio-economic status.

Background data

Language spoken at home

South Africa has 11 languages recognised in the constitution including nine indigenous African languages. As can be seen from Table 5, the learners who were assessed at the start of the year came from homes speaking 10 languages although 99% reported that they spoke one of the assessment languages at home. Although most learners were learning in their first language, a proportion were being taught in a second language. Only 5% of learners assessed in Afrikaans did not nominate Afrikaans as their home language. However, 18% of learners assessed in English did not identify English their home language in contrast to almost all learners (98%) assessed in isiXhosa who said that this was the language spoken at home. Bilingualism in the home is common in South Africa and even at this young age, children may be multilingual, especially in urban areas. Anecdotal evidence from principals and teachers suggests that a number of children from isiXhosa and Afrikaans speaking families are sent to English medium school in the belief that they will gain long term advantages. As many as 70% of learners in English medium schools in Grades 4 and 5 speak a different language at home (Howie, van Staden, Tshele et al., 2012).

Table 5 Learners' home language and language of instruction at the start of Grade 1 in Western Cape sample

		Language of instruction			Total
		Afrikaans	English	isiXhosa	
Home language	Unidentified or other	0	15	1	16
	Afrikaans	905	17	0	922
	English	43	733	16	792
	French	0	4	1	5
	German	0	1	0	1
	SeSotho	0	1	0	1
	SiSwati	0	1	0	1
	Xitsonga	0	1	0	1
	isiXhosa	8	124	830	962
	isiZulu	0	1	0	1
Total		**956**	**898**	**848**	**2702**

Sex

The sample comprised 48.8% females and 51.2% males, and these proportions did not vary across language of instruction ($p>.05$).

Age

The average age at the time of the first assessment was 6.81 years (Standard Deviation = 0.49) with the youngest child being 5.68 years and the oldest 9.70. The ages did not differ greatly for the three languages as illustrated in Figure 1, although there were, proportionally, more older learners in the Afrikaans sample.

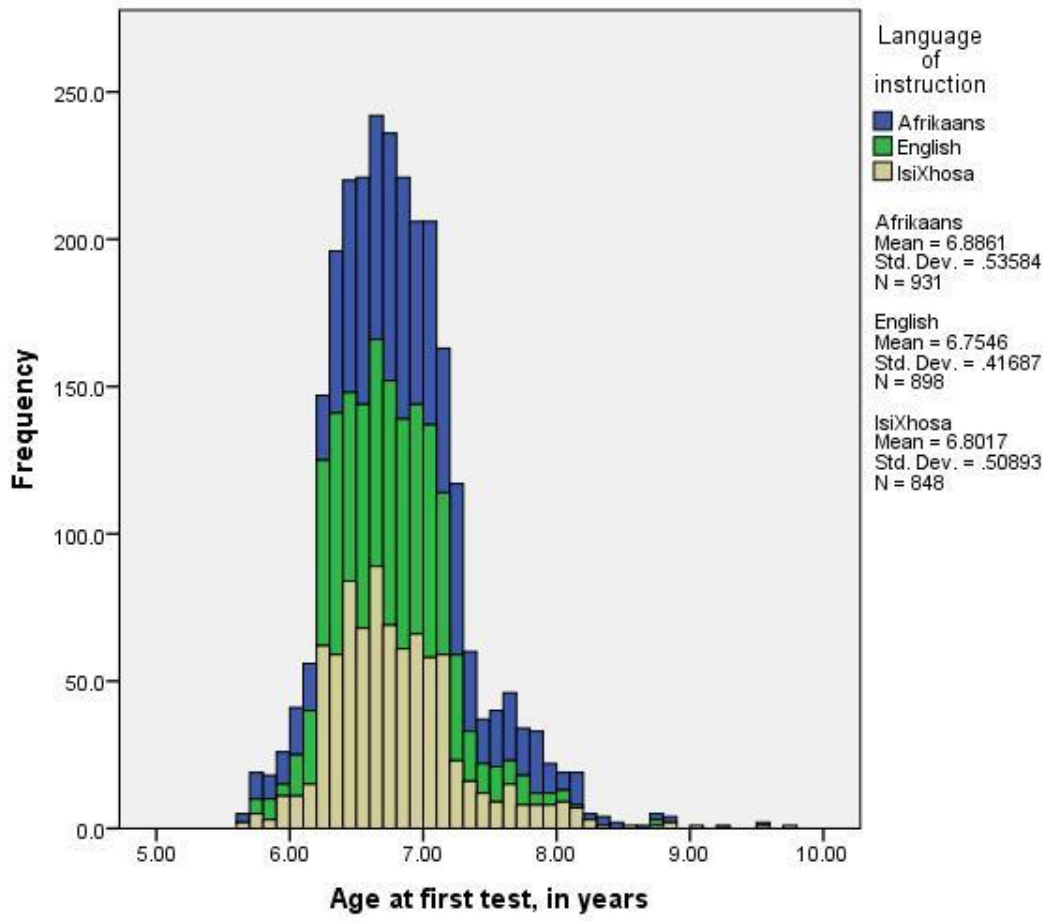


Figure 1 Age distribution for the three language groups in the Western Cape at the start of Grade 1

Ignoring the groups of older learners (those above about 7.5 years of age) the distribution of ages is approximately normal. This contrasts with the pattern in some other countries such as England where the distribution is approximately rectangular. The policy in South Africa is that the child should start school in Grade 1 within the year they become seven years of age, but it seems that some parents opt to send their children to school at a younger age and some, about 10%, are older than expected. Grade 1 is the grade that is repeated most often in the South African schooling system (DoE, 2007) and this could account for some of the older learners in the sample.

Socio-economic status (SES)

In South Africa, schools are categorised into quintiles according to the affluence of their location for the purpose of the funding formula for schools. Quintile 1 represents the poorest neighbourhoods, which are often found in formerly designated black townships. Quintile 5 is the most affluent and they are often in formerly white suburbs. The breakdown of school quintiles by language group is shown in Table 6 where NQ1 refers to Quintile 1, NQ2 to Quintile 2 and so on.

Table 6 Number of participating schools by quintile and language group in Western Cape

		Quintile				Total
		NQ2	NQ3	NQ4	NQ5	
Language of Instruction	Afrikaans	2	6	28	4	40
	English	0	0	11	25	36
	isiXhosa	14	19	3	0	36
Total		16	25	42	29	112

The English language schools were from the top two quintiles (4 & 5). The Afrikaans language schools were spread across the top four quintiles but concentrated in the 4th quintile (70%). The isiXhosa language schools were predominantly from Quintiles 2 and 3. Of the lowest quintile schools, 88% were isiXhosa, illustrating the persistent effect of South Africa's historical racially-based policies. There were no Quintile 1 schools in the three districts we sampled – they are usually found in remote areas and extremely poor environments.

Data were also collected from 1,924 learners on a scale constructed for this study using the home background questionnaire reported in Section 3.2. It had a reliability of 0.84. All items correlated well together and there were no indications of poor model fit. We called the scale SES (socio-economic status).

The data show a relationship between the school quintile and the average SES scale within each school (see Table 7), with significant differences in levels of overall socio-economic status. In particular, learners in the Quintile 5 schools appear, on average, to be significantly more affluent than learners from other quintiles. This SES scale showed a small, positive correlation with school quintile (0.31, p<.001).

Table 7 Average SES score for learners within each quintile

Quintile	n	SES
NQ2	352	-.49
NQ3	597	-.26
NQ4	1014	-.12
NQ5	631	1.39

5. Results

The results are reported in relation to the research questions.

5.1 Research Question 1: What do children in the Western Cape know and what can they do when they start school?

The results for reading, mathematics, vocabulary and phonological awareness at the start of the year are presented first and the learners' levels of personal and social development are then reported graphically. The behaviour scores are also reported.

Reading

In Figure 2, learners' reading levels and the difficulty of the questions are placed on the same logit scale. The learner's reading levels are shown as # symbols on the left side of the map, with each # representing 14 learners. Points with fewer than 14 learners are shown as dots. The 'Measure' column at the left side of the map shows the Logit scale which, in this instance, ranges from -9 to +5. The difficulty of each item is shown on the right side of the map. The more negative the value on the Logit scale, the easier the item. The scale moves from negative through to positive and items located higher up in the scale are more difficult than those lower on the scale. Similarly, with the positioning of learners on the Logit scale; the more able learners have more positive scores than the less able.

The 'M's on the scale denote the mean score of the learners on the left side of the scale, and the mean difficulty of the reading scale on the right side with the items. Looking at the item map, we can see that learners' reading levels are approaching a normal distribution with some learners of very low ability, the majority in the middle, average range, and some learners with very high scores. The mean ability of the learners is lower than the mean difficulty of the items, which suggests that there are a good number of items that were too difficult for many of the learners at the start of school. Since the assessment is repeated at the end of the year to measure progress, this would be expected. However, note that there is a small group of approximately 28 learners who were able to answer all questions correctly at the start of school. These learners are represented by the dots extending to the top of the scale, with each dot representing a point that has been reached by between 0 and 14 learners. The 'S's on the scale denote one standard deviation above and below the mean and the 'T's two standard deviations from the mean.

At the easier end of the scale, most learners were able to point to someone who was reading in a picture of learners in a classroom, which is one of the questions in the Ideas about Reading section. Learners within the average range of reading ability were typically able to identify the letters of the alphabet and read aloud simple, high-frequency words in short sentences. Learners with the highest level of reading ability were able to read aloud short stories which included words such as 'quite', 'sometimes' and 'tastes' and their equivalent in Afrikaans and isiXhosa. They were also presented with a short story where approximately every fifth word was replaced with a choice of three, and asked to select the most appropriate word from that choice. This required these learners to read words such as 'comfortable', 'everyone', 'cushion' and 'carried' in the three languages and to understand the text sufficiently to be able to make an informed choice about which word from each choice of three best fit into the sentence.

This item map can provide teachers with information about the learning progression so that they can pitch their teaching appropriately. At policy level, the item map could make an important contribution to curriculum design, providing information about the order in which learners of this age acquire reading skills.

Figure 2 Reading Item Map for overall Western Cape sample

One way to think of these results is that they show a progression pathway which learners follow on their way to full literacy. At the Ground level, children are starting to understand what reading is without being able to do any of the activities usually associated with reading. They then move to the Letters stage as they start to learn more about writing and can read many letters. At the next stage (Words) the learners can decode and/or recognise some words and read simple sentences. They then

move on to Sentences when they become adept at reading and finally to Comprehension, when they not only read but understand passages of text. This is shown below in Figure 3:

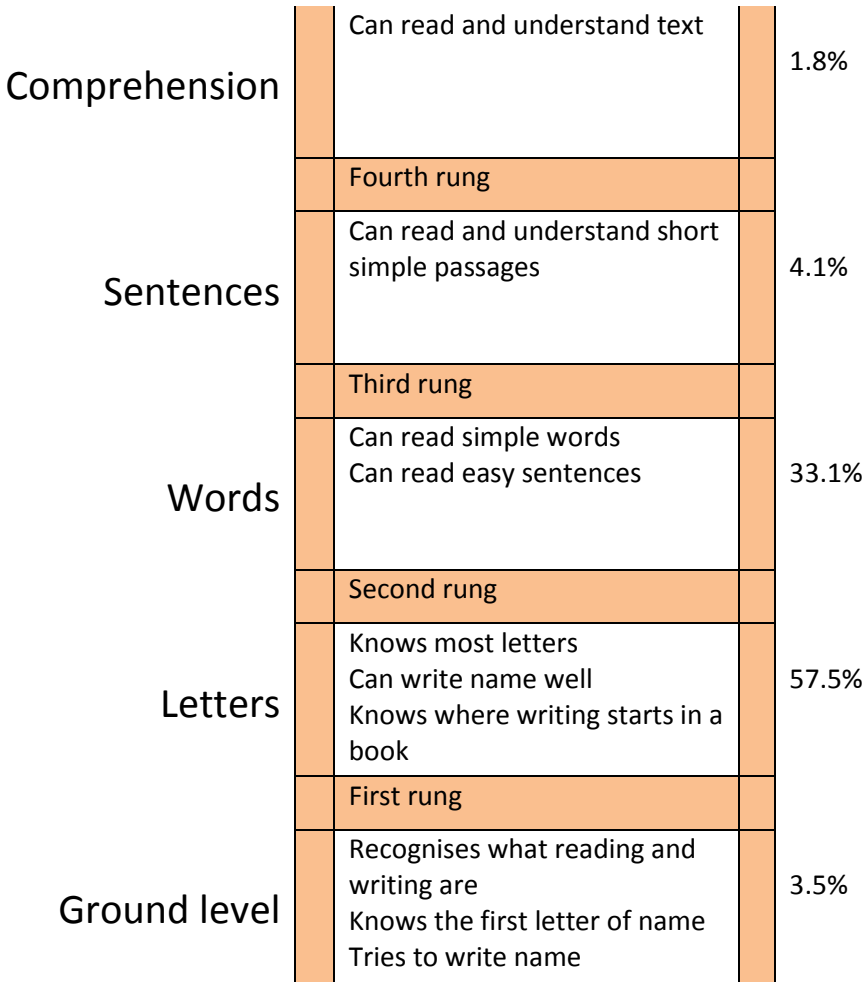


Figure 3 Reading ladder for overall Western Cape sample

A small proportion of learners were starting school at the Ground level; they were able to distinguish children reading and writing within a picture of a classroom scene, they knew the name or sound of the first letter of their name and they were able to make an attempt to write their own name. This is a very small proportion of learners. Most learners in the sample were at the 'letters' and 'words' stages (between the first and third rung of ladder) of the pathway or higher. At the Letters stage, they were able to give the name or sound of most letters, when they attempted to write their own name they included mostly correct letters written in a recognisable style and they knew where to start reading the writing on a book page. Very few learners were reading short passages with

understanding. However, as noted earlier, this would not be expected at the beginning of Grade 1 but would be hoped for at the end of Grade 1.

Mathematics

The Logit scale for mathematics covered a wide range of ability. Virtually no learners were able to answer all questions correctly, leaving material for able learners at the end of the year. At the easiest end of the scale, learners were able to point to the biggest cat in a picture of three cats of different sizes (Biggest), and count four objects (How many balls?). Learners in the average range were typically able to name single digits and were just starting to name one or two double digits, answer questions such as 'What is one more than five?' (1>5) and 'Here are three bicycles, if we put one more in the picture, how many would there be?' The most able learners were capable of carrying out calculations presented with formal notation such as '9 – 6 =', perform simple calculations involving money and identify three-digit numbers. Figure 4 shows the item-person map for mathematics for the overall Western Cape sample.

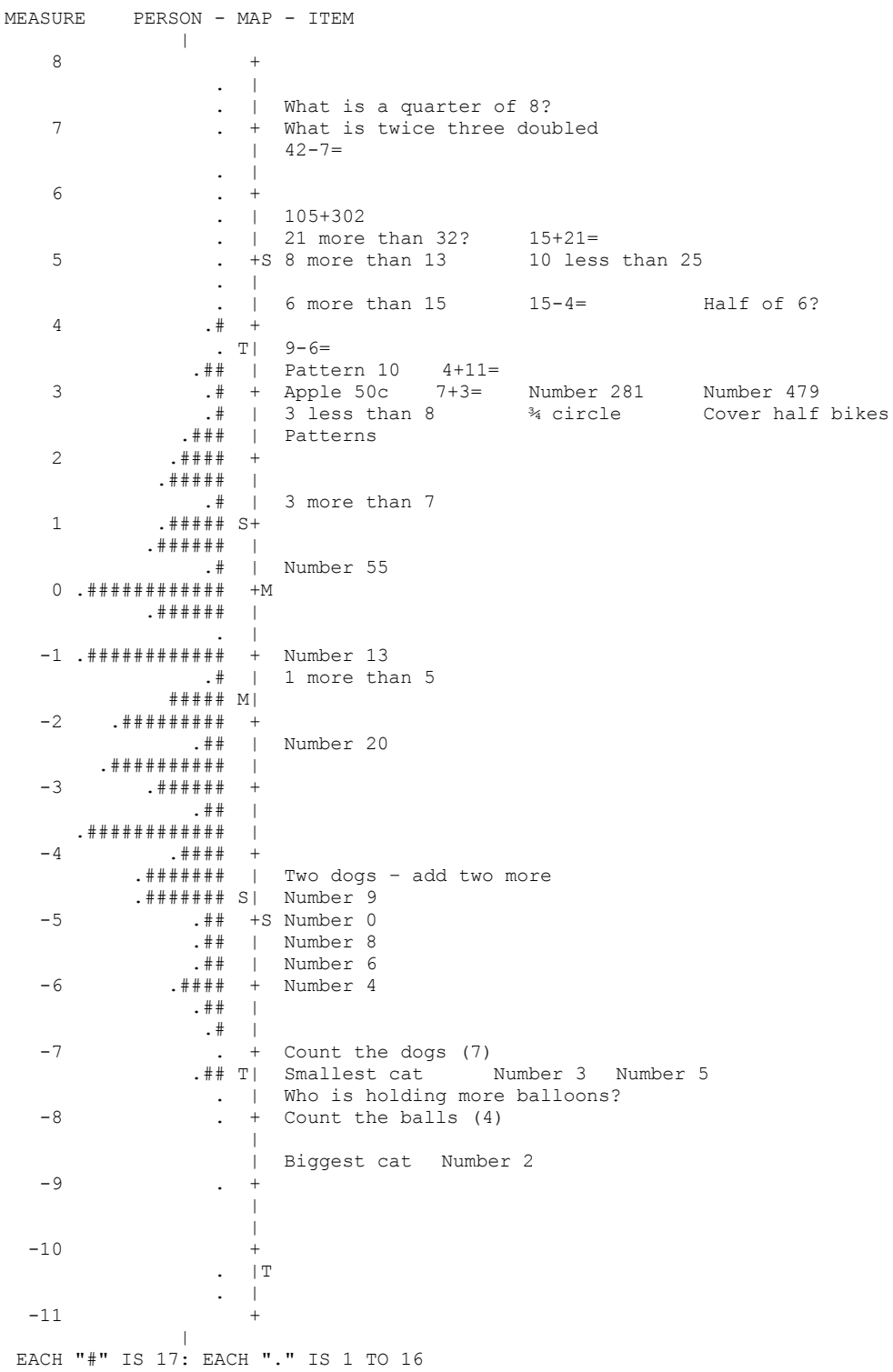


Figure 4 Mathematics Item Map for the overall Western Cape sample

An overview of the mathematics results for the Western Cape sample is represented in a ladder (see Figure 5).

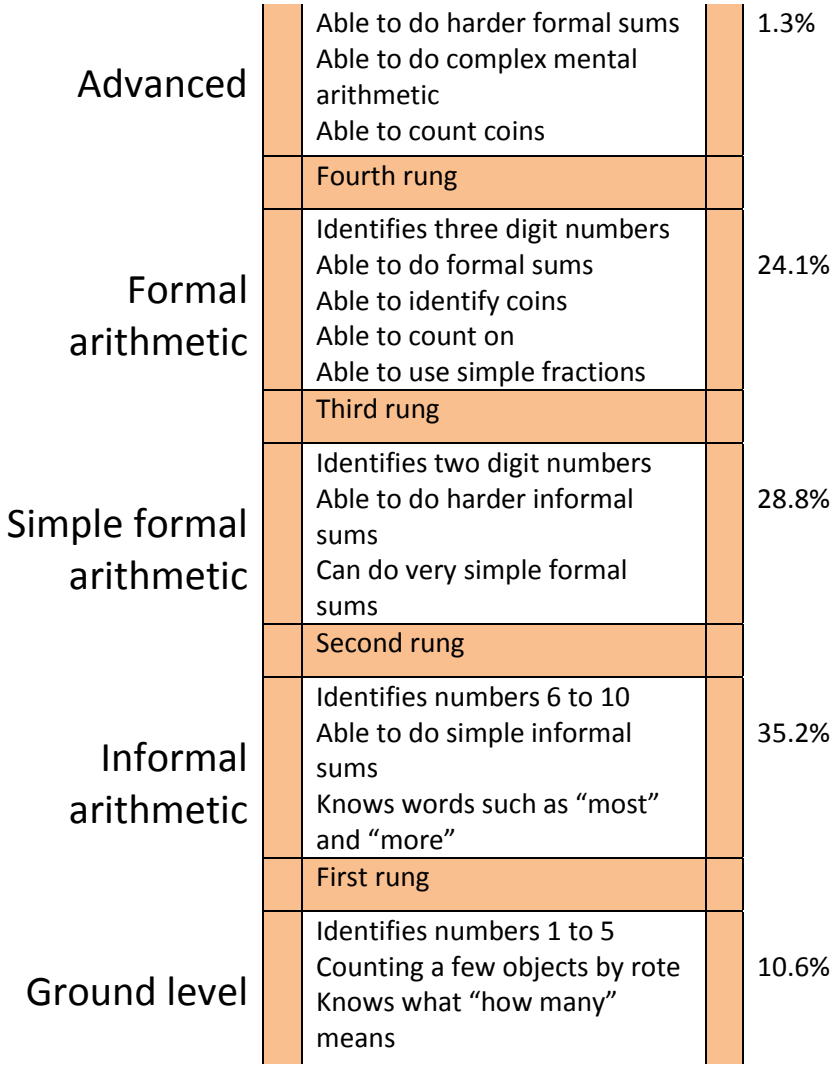


Figure 5 Mathematics ladder for the overall Western Cape sample

Most learners were at the "informal arithmetic" or "simple formal arithmetic" levels although there was considerable variation; more so than for reading.

Vocabulary

The item/learner maps for each of the three languages are shown in the first report (Howie et al., 2016). Almost all learners who were assessed in Afrikaans were able to point to items commonly found in a kitchen such as a fork, knife and pan. Less frequently known words were "jewellery" and "microscope". These are also difficult words for learners in other countries. Virtually none of the learners could identify the body parts: "joint", "tendon" and "bicep".

Phonological awareness

As with the vocabulary, the phonological awareness item/learner maps are shown in the first report (Howie et al., 2016).

The item maps for Afrikaans and English illustrate that phonological awareness was easy for many learners, with many answering all items correctly. But, there was still a number of learners who were able to repeat some words accurately but were not yet able to identify rhyming words. This skill of rhyming is important for success in reading (Goswami, 1990) and identifying learners who have difficulties at an early stage of their schooling means that interventions can be used to improve their chances of reading successfully when they are older.

This scale in the isiXhosa version was more difficult for the learners than the English or Afrikaans versions. This is a potentially important finding. Many of the learners who were assessed with the isiXhosa version were unable to answer any questions about rhyming correctly. Qualitative investigation is required to find out whether this is because of the administration of the instructions, the rhyming words themselves or whether the concept of rhyme is less familiar in the isiXhosa language.

Personal and Social Development

Teachers were asked to rate each child's personal and social development on a five-point scale, with a score of 5 indicating positive conduct listed earlier.

About 80% of the learners who were sampled were rated by their teachers (n = 1,447). This is a good response rate from busy teachers.

Males and females were equally represented ($p>.05$). The rates were similar for Afrikaans, English and isiXhosa respectively and across quintile groups.

Whilst the response rates were good, we must be tentative in drawing any comparative conclusions because teachers may vary in the leniency/severity with which they give ratings. In other words, teachers in one language group, or quintile, might give higher ratings for similar learners when compared to teachers in another language groups or quintile. Despite these provisos, it is thought to be worth reporting the findings.

The responses are shown in Figure 6.

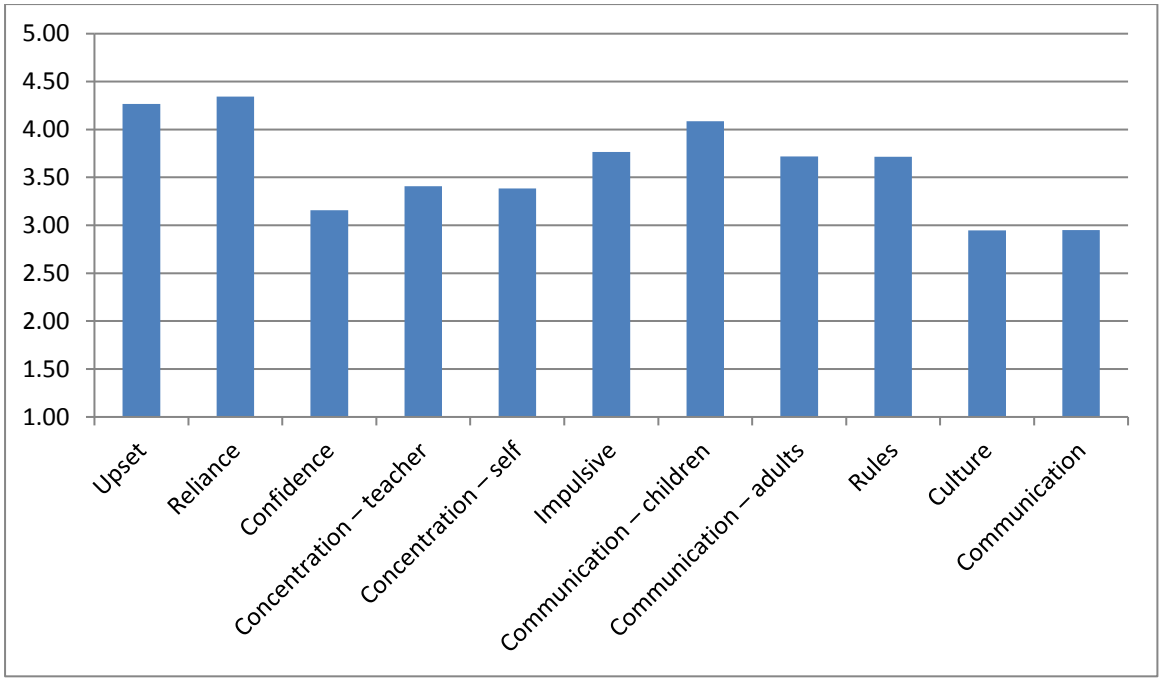


Figure 6 Mean scores for Personal and Social Development for learners in Western Cape sample at the start of Grade 1. See Section 3.1 for the list of variables

Learners were reported as being comfortable in the school environment and self-reliant with personal activities. The mean scores were lower for confidence, cultural awareness and communication; a score of 3 was equivalent to 'sometimes' on the rating scale. This might be expected for the beginning of Grade 1 where the learners are in a new environment with new classmates and some in very diverse settings. The earlier cautions about this scale being based on teachers' judgements should be borne in mind when interpreting the results. These provide an overall pattern of learners' personal and social development at the start of school and are valuable in suggesting that some learners may need additional support in areas such as building their confidence, concentration and general communication skills.

5.2 Research Question 2: How do the starting points and progress vary by sub-groups: Language of instruction, home language, sex, home backgrounds (socio-economic status) and attendance in Grade R?

In this section we compare the measures at the start of Grade 1 for each of the sub-groups (language of instruction, home language, gender and socio-economic status). We start with cognitive measures followed by personal and social development, and behaviour.

Correlations between the cognitive measures

Before exploring the differences between the sub-groups, we investigated the correlations between the cognitive measures. All the cognitive measures correlated positively with one another as shown in Table 8.

Table 8 Correlation of the cognitive measures per Western Cape language groups

		Reading	Maths	Vocabulary			Phonological awareness		
				Afrikaans	English	IsiXhosa	Afrikaans	English	IsiXhosa
Reading		1	0.63	0.35	0.52	0.35	0.37	0.38	0.30
Maths		0.63	1	0.29	0.46	0.31	0.36	0.38	0.26
	Afri	0.35	0.29	1			0.38		
Vocab	Eng	0.52	0.46		1			0.45	
	isiX	0.35	0.31			1			0.25
	Afri	0.37	0.36	0.38			1		
Phonl. Awar	Eng	0.38	0.38		0.45			1	
	isiX	0.30	0.26			0.25			1

All of the correlations were significant p<0.01

The strongest link with a correlation of 0.63 was between reading and mathematics. This is close to correlations found between reading and mathematics in the UK where learners have been assessed at the start of school with iPIPS. For example, a correlation of 0.7 was found in Scotland where learners were typically five years old at the start of school, and a correlation of 0.73 in England where learners were typically 4.5 years old at the start of school (Tymms et al., 2014; Tymms et al., 2016).

All of the separate vocabulary measures correlated significantly with reading and mathematics, although the correlations were lower. The same held for phonological awareness.

Links between age and the cognitive measures

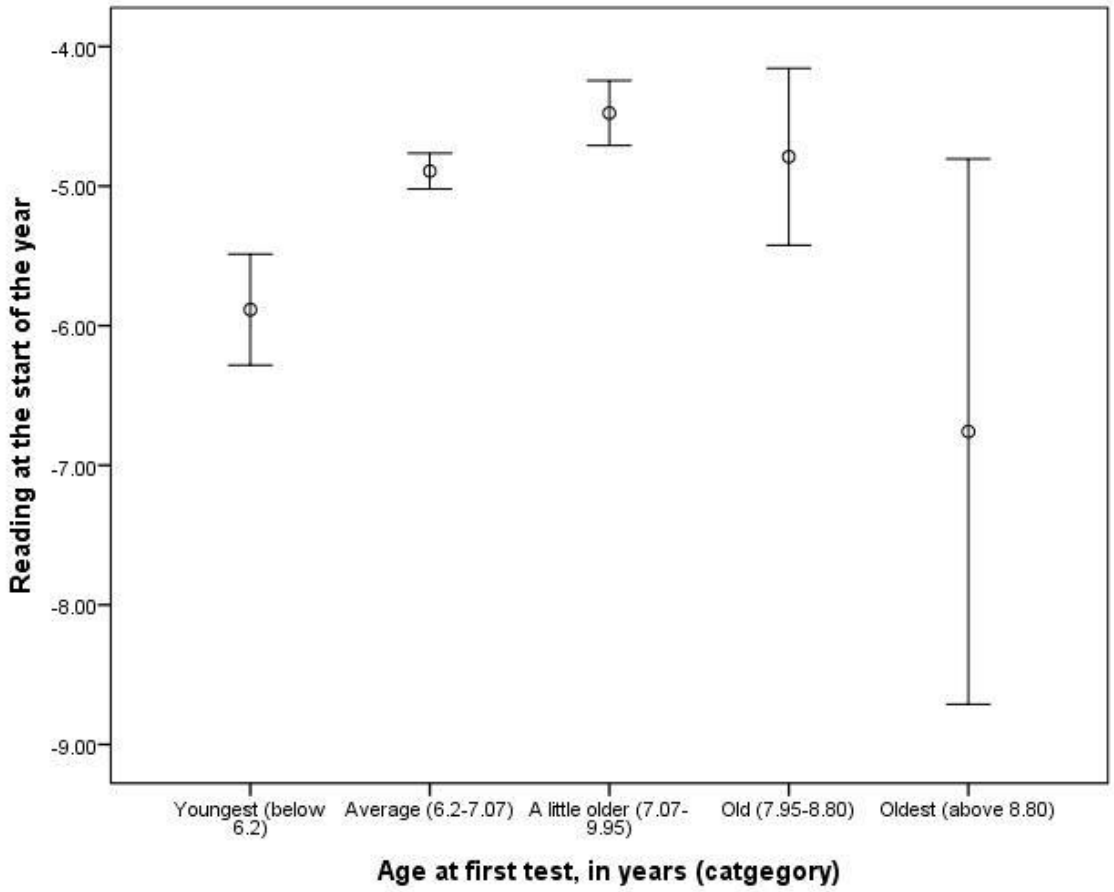
It has already been noted that the ages of the learners in the study varied considerably despite all being assessed at the start of the first year at school. It has also been noted that the average age was similar across the three language groups. With that in mind the correlations of the overall cognitive measure with age are given in Table 9.

Table 9 Correlation of age of Western Cape language groups with the cognitive measures

Cognitive measures	**Test language**	**Age *r***
Reading		0.09**
Mathematics		0.08**
Vocabulary	Afri	0.08**
	Eng	0.09**
	isiX	0.04
Phonological. Awareness	Afri	0.03
	Eng	0.05
	isiX	-0.01

** p<.01

The correlations are low; lower than was reported for England and Scotland (Tymms et al., 2014, Tymms et al., 2016). This is because the correlation calculations assume a linear relationship between age and the cognitive outcome. Further investigation of the data show that there is a linear positive link to age up to about the age of seven (Figure 7) but then older pupils have lower scores than might be expected, thus reducing the correlations. Presumably the pattern is the result of older learners either repeating the year or missing out on schooling a year earlier as noted earlier in Section 4.



NB The y-axis is in logits

Figure 7 Reading measure with 95% confidence Intervals for five age categories

All the correlations were higher once the curvilinear relation was taken into account: See Table 10.

Table 10 Correlation between age of Western Cape language groups and the overall cognitive measure using quadratic equations

Cognitive measure	Test language	Age *r*
Reading		0.13**
Mathematics		0.15**
	Afrikaans	0.11**
Vocabulary	English	0.16**
	isiXhosa	0.11**
	Afrikaans	0.10**
Phonological Awareness	English	0.13**
	isiXhosa	0.03

** p<.01

Sex differences on the cognitive measures

In comparing groups, the main focus is on the size of the difference, the Effect Size (ES), rather than on the statistical significance of the difference. Nevertheless, independent samples were used and for each outcome a note is made about the significance of the difference. As a general rule of thumb, Cohen (1988), suggested that an ES of 0.2 is considered to be a small difference between groups, 0.5 moderate and 0.8 or higher a large difference.

The table shows that the girls were slightly ahead of the boys on most cognitive measures, the exception being those tested in Afrikaans for Phonological Awareness.

Table 11 Differences per cognitive measure between boys and girls in Western Cape per language group at the start of school in Effect Sizes

Cognitive measure	Test language	Girls - Boys
Reading		0.13**
Mathematics		0.02
Vocabulary	Afrikaans	0..07
	English	0.02
	isiXhosa	0.00
Phonological Awareness	Afrikaans	-0.13
	English	0.17*
	isiXhosa	0.08

*p<.05 ** p<.01

Note: Girls-Boys means how much better the girls' scores were than boys'

Links between socio-economic status and cognitive measures

Learners' scores in reading were compared across the quintiles (2-5). There was a clear difference between NQ5 and NQ2 with an ES of 0.41 (p<.01). No significant difference (p >0.05) was recorded for NQ2, NQ3 and NQ4.

The ES for the difference between learners' mathematics performance was 0.14 between NQ2 and NQ5 (p<.01) which was less than for reading. As with reading there was no significant difference between NQ2, NQ3 and NQ4.

The SES measures were used to put schools into four equal categories and then the correlations of those categories with quintile groups and the cognitive measures were calculated. They are shown below.

Table 12 Correlations between cognitive measures and quintiles/SES per Western Cape language groups

Cognitive measure	Test language	Quintile r	SES category *r*
Reading		0.27**	0.35**
Mathematics		0.21**	0.31**
Vocabulary	Afrikaans	0..08*	0.15**
	English	0.27**	0.38**
	isiXhosa	-0.13**	-0.03
Phonological Awareness	Afrikaans	-0.03	0.16**
	English	0.13**	0.28**
	isiXhosa	-0.07*	0.10**

*p<.05 ** p<.01

The correlations with SES category were stronger than the correlations with the Quintile classification which was a school level measure collected for financial planning. In some cases, the correlations were significantly negative which contradicts one of the best-established relationships in educational research: that children from less advantaged backgrounds tend to get lower test scores. As a result, the SES measure will be preferred in further analyses for this report.

Link between attendance at Grade R and cognitive measures

Overall, 67% of Learners had attended Grade R: a year's education before the start of Primary 1. The highest attendance was amongst those attending isiXhosa medium schools (82%) and the lowest was at Afrikaans medium schools (49%). This compares with the 70% of those attending English medium schools.

The scores for all four cognitive measures (reading, mathematics, vocabulary and phonological awareness) were significantly higher for those learners who had attended Grade R with two exceptions; they were vocabulary and phonological awareness for the isiXhosa group.

Differences in language of instruction and behaviour

Teachers rated their learners' levels of inattention, hyperactivity and impulsivity – referred to as Behaviour in much of this report. It is well established that these behaviours are characterised by Attention Deficit Hyperactivity Disorder (ADHD). These characteristics are associated with lower than expected starting points at school (Merrell et al., 2017). Teachers in this project scored the learners on the behaviour rating scale described earlier at the start and the end of Grade 1. This scale is potentially revealing in the Western Cape because there is research evidence to suggest that children with foetal alcohol syndrome show ADHD symptoms (Peadon and Elliott, 2010). May et al., (2000), referring to the Western Cape, wrote: "*A high rate of foetal alcohol syndrome was found in the schools--40.5 to 46.4 per 1,000 children aged 5 to 9 years--and age-specific community rates (ages 6-7) were 39.2 to 42.9. These rates are 18 to 141 times greater than in the United States. Rural residents had significantly more foetal alcohol syndrome. After control for ethnic variation, children with foetal alcohol syndrome had traits similar to those elsewhere: poor growth and development, congruent dysmorphology, and lower intellectual functioning. … This study documented the highest foetal alcohol syndrome rate to date in an overall community population." (page 1905).*

We created a scale for inattentive, hyperactive and impulsive behaviour (from 0 to 5 corresponding to the frequency of exhibiting symptoms from low to high) at the start of the year using all of the items and correlated it with the cognitive measures. Therefore, the higher the behaviour score, the greater the level of impairment. The results are shown in Table 13.

Table 13 Correlations between cognitive measures and inattentive, hyperactive and impulsive behaviour scale in Western Cape sample

Cognitive measure	Test language	n	Behaviour
Reading	Overall	1562	-0.34**
	Afrikaans	568	-0.40**
	English	551	-0.28**
	IsiXhosa	453	-0.29**
Mathematics	Overall	1557	-0.35**
	Afrikaans	566	-0.37**
	English	539	-0.32**
	IsiXhosa	451	-0.27**
Vocabulary	Afrikaans	587	-0.14*
	English	466	-0.16**
	IsiXhosa	494	-0.19**
Phonological Awareness	Afrikaans	585	-0.20**
	English	469	-0.22**
	IsiXhosa	497	0.01

*p<.05 ** p<.01

The correlations are low to modest, but suggest that those with high behaviour scores tend to start school around one standard deviation behind those with very low scores. This is a large difference. If someone is a standard deviation behind the average then instead of being ahead of 50% of the population they would be ahead of just 16%. Furthermore, the relationship to reading and mathematics varied by language group. The correlations were noticeably highest for the Afrikaans group where the correlations between behaviour and reading and mathematics were -0.40 and -0.37 respectively. These are alarmingly high and are probably so high because there is such a spread of scores in that group. The distributions are shown in Figure 8.

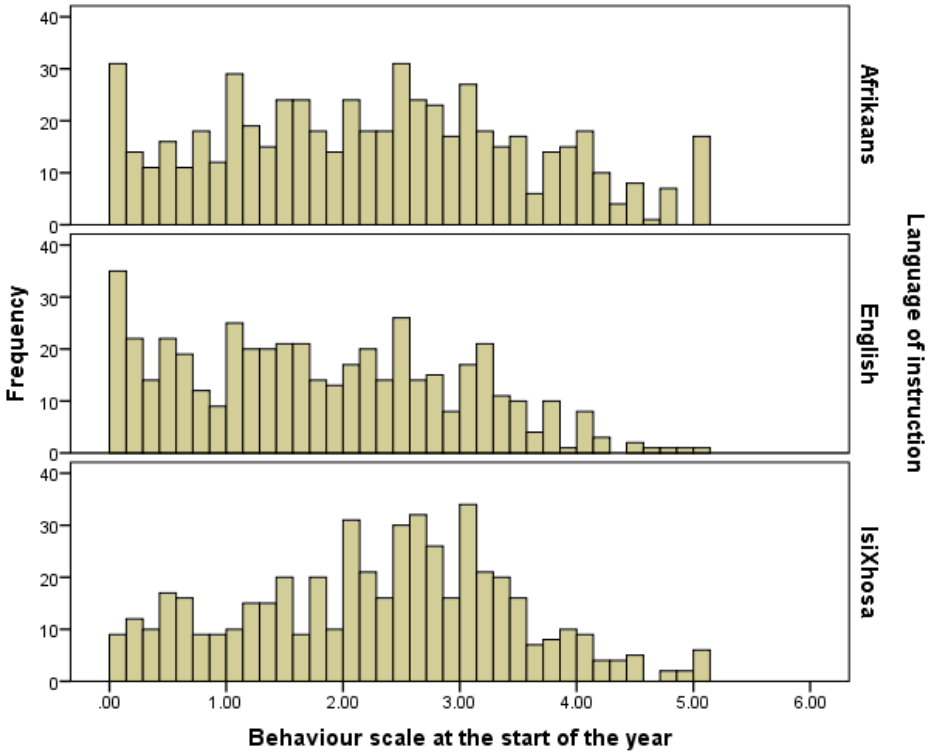


Figure 8 Distribution of inattentive, hyperactive and impulsive Behaviour scores across the three language groups in Western Cape schools

The distributions, which show a wide spread of scores, can be compared with nationally representative data for England for children aged five years (Figure 9).

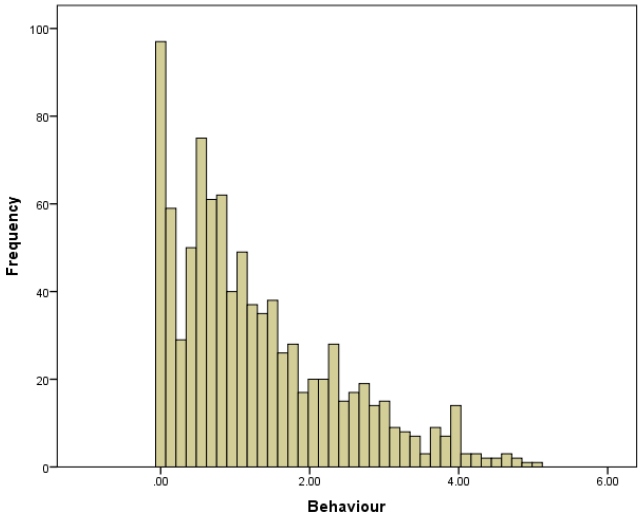


Figure 9 Distribution of inattentive, hyperactive and impulsive Behaviour scores in England for 5-year-old children in first year of school

The striking feature of the data from England is the small proportion of high scores and the high proportion of very low scores. This is far from a normal distribution and results is a small proportion attaining very high scores. This contrasts with the data from the Western Cape, particularly with the Afrikaans medium schools. Of course, the Western Cape and England are different in terms of cultural norms, expected behaviour from young children and social desirability. And so, ratings by teachers from the two areas of the same behaviours can be expected to produce different results. But we would not expect to find differences as large as those reported above. We also note that the published negative link between the Behaviours and attainment (Merrell et al., 2017) mentioned earlier referred to English data, and that a key finding of that paper was that the link between lower attainment and Behaviour did not depend on a diagnosis of ADHD, but was seen at all levels on the scale, albeit to varying degrees.

Languages of instruction and cognitive measures

Table 14 End of Year attainment levels for cognitive measures across language groups

Cognitive measure	Test language	n	End of Year Score (in logits)
Reading	Afrikaans	867	-1.96
	English	862	.20
	IsiXhosa	768	-2.28
Mathematics	Afrikaans	867	2.25
	English	862	3.67
	IsiXhosa	769	2.34
Vocabulary	Afrikaans	866	.28
	English	862	1.28
	IsiXhosa	769	.12
Phonological Awareness	Afrikaans	867	1.95
	English	860	2.07
	IsiXhosa	769	.24

As shown in Table 14, there were differences in the end of year scores across cognitive measures. Differences between cognitive developmental levels in reading by language were apparent. ES in the English language scores were 0.38 higher than the Afrikaans language scores and the isiXhosa language scores were 0.48 lower than the Afrikaans language scores. All of the differences were statistically significant ($p<0.01$).

As with reading, there is much overlap between language groups in mathematics with the English-speaking learners generally attaining higher scores than the other two groups. In ES, the English language scores were 0.40 ahead of the Afrikaans language scores and the isiXhosa language scores were 0.29 behind the Afrikaans language scores. As with reading, all of the differences were statistically significant ($p<0.01$).

Viewing all variables together

Clearly, there are many factors which may influence the starting points of learners in the Western Cape schools. The key ones have been outlined above and here they are all brought together to estimate their relative importance. A technique known as multi-level modelling (MLM) is employed, and, because there were some missing data, a further technique known as imputation was used to estimate the scores of learners where the data had not been collected. This provides the best estimate of the relative importance of the variables in predicting Reading and Mathematics scores. Details of the procedures and findings are given in the appendix. Finally, the strength of each factor in the MLM was converted to an ES (Tymms, 2004), to produce the results for reading shown in Figure 10.

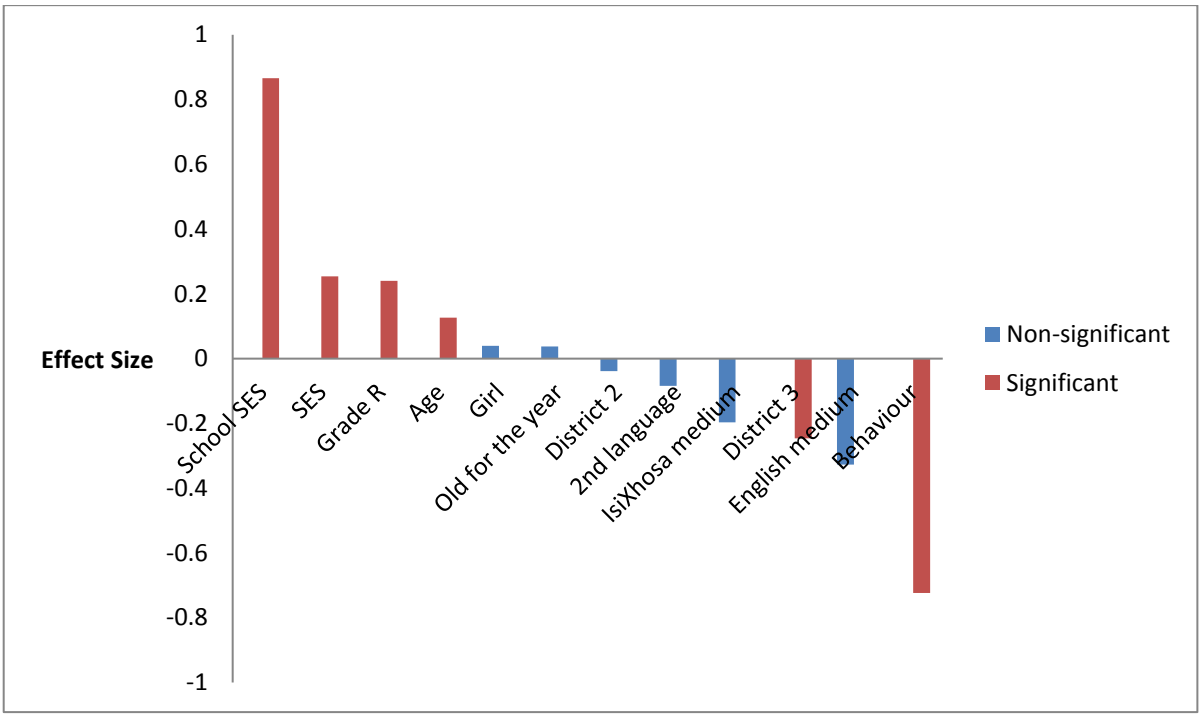


Figure 10 Effect Sizes from multi-level models for reading at the start of Grade 1 in Western Cape sample

Figure 10 shows that, when examined together, just a few factors are statistically significant and of substantive importance when predicting the reading levels of children start school. They are: the

background of the children as measured by the SES of individuals, the SES of the school as a whole and the District (District 3 had lower than expected scores), the behaviour ratings given by the teachers in the first term, attendance at Grade R and the age of the child.

Why are these variables of importance? The SES measure captures the socio-economic background of the family from which they child comes and is expected to relate to cognitive outcomes. It will be linked to the time that the parents or guardian have available to devote to the learner, the finances available to spend on educational relevant objects and on health, the presence of a stimulating environment, the knowledge and skills of the parent/guardians and therefore their general ability of help the chid. This measure is important at three levels, firstly at the pupil level and secondly at the school level, which potentially captures neighbourhood interactions as well, perhaps, as the aspirational levels of the parents/guardians as the select schools. The third level, the district, picks up the same contrast at a further level of aggregation and appears in the chart as a significant negative coefficient for District 3.

Attendance at Grade R is intended to help learners prepare for school and it is gratifying to see that the data suggest that this is working. That older children tend to have higher scores is unsurprising.

Finally, there is a substantive link to the measure of inattention hyperactivity and impulsivity (labelled Behaviour in the figure). This corresponds to the well-established link between inattention and attainment. The only surprise is the magnitude of the link.

A number of factors which, by themselves are important, are not significant when considered with other variables. They are: sex, being old for the year (older than 7.5 years, see Figure 1), attending a school which teaches in a medium other than the home language, and the schools' medium of instruction.

The results for mathematics follow in Figure 11.

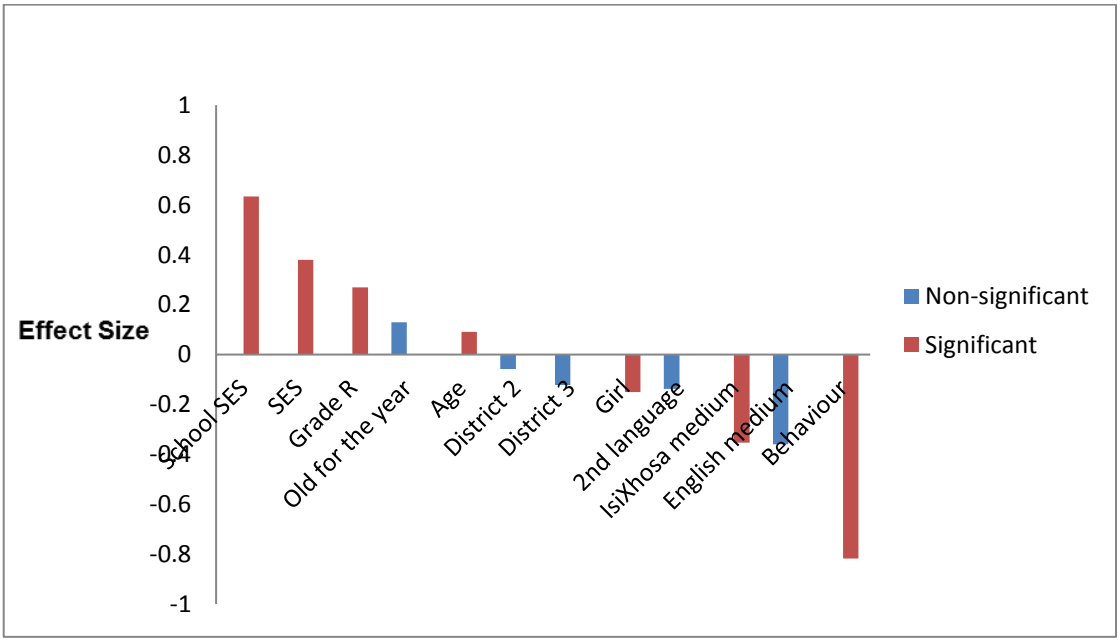


Figure 11 Effect Sizes from multi-level models for mathematics at the start of Grade 1 in Western Cape sample

The results are broadly similar to those for reading and the explanations are also similar, although girls started with lower scores than boys from similar backgrounds and learners at isiXhosa medium school started at lower points than learners with similar backgrounds in schools with Afrikaans as the medium of instruction. The links to attendance at Grade R, and having behavioural difficulties, were greater for mathematics than for reading whilst the links to SES were lower. It is generally found that mathematics is more amenable to education and that reading is more linked to SES.

Personal and Social Development (PSD)

Languages of instruction and PSD

The mean score for each item by language of instruction is shown below in Figure 12.

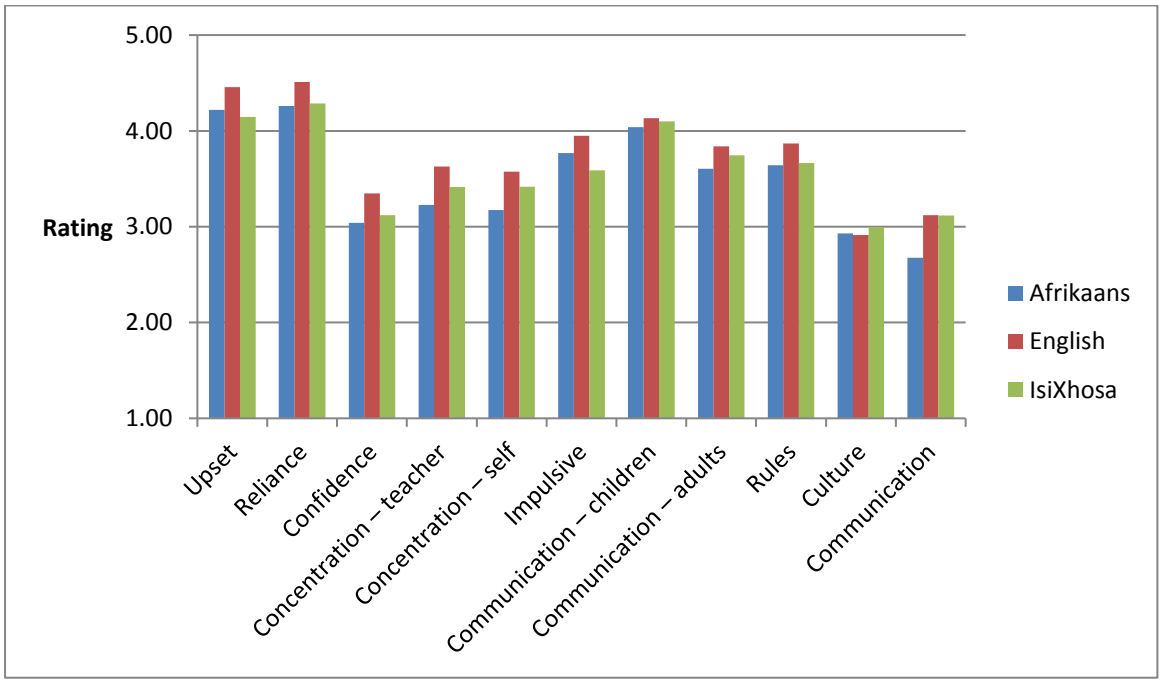


Figure 12 Mean scores for Personal and Social Development of learners rated by teachers for learners in Western Cape sample as previously described in Section 3.1

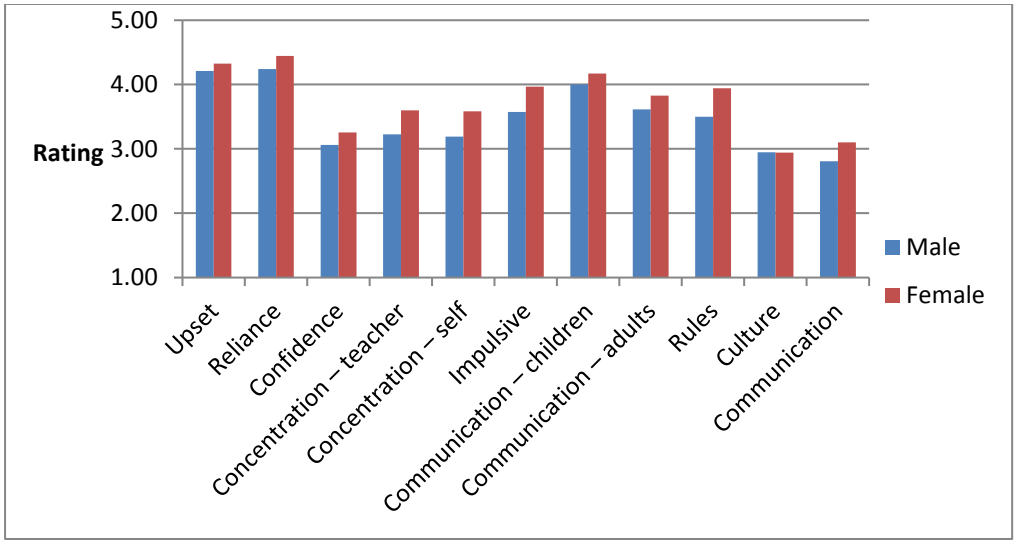
There were significant differences ($p<0.05$) in the reporting for all statements across languages except for two statements: "Communication - children" and "Culture". In a few cases, pairs of language groups did not differ from one another but they did differ from the third group. For example, for the Reliance statement, the Afrikaans and isiXhosa groups did not differ significantly but the Afrikaans and isiXhosa groups differed significantly from the English group.

The scores of the English-speaking learners tended to be slightly more positive than the other two groups with the exception of cultural awareness, where they were least positive, and for communication, where their mean score was the same as the Afrikaans-speaking learners.

However, as noted earlier, the response rates varied across the language groups and the differences seen in the figure may have their origin in the different response rates or in different perceptions of the teachers in the different schools.

Differences between Boys and Girls for PSD

The mean scores comparing male and female learners in personal and social development are reported in Figure 13.



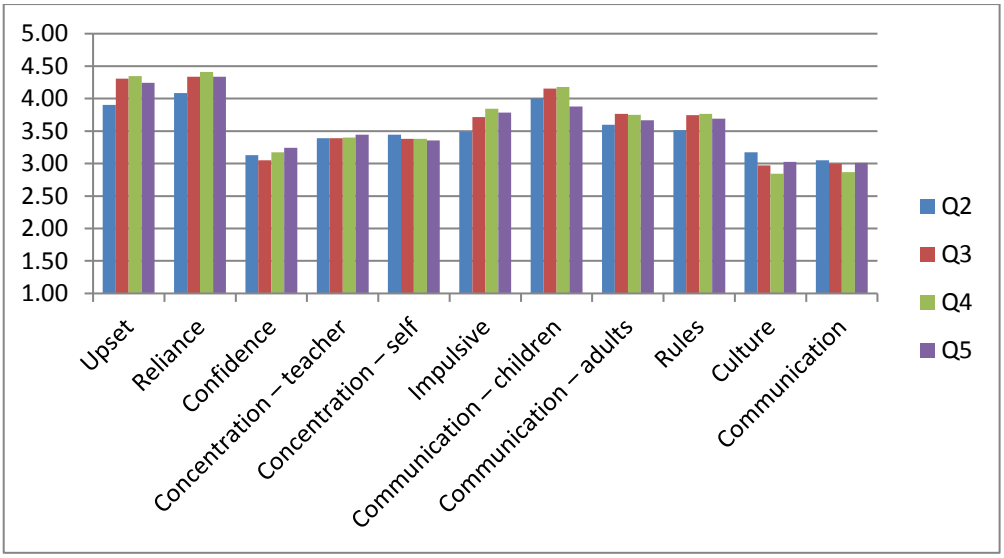
NB: All differences were significant at the 5% level except for "Culture"

Figure 13 Mean scores for Personal and Social Development by sex for Western Cape sample. See Section 3.1 for the list of variables

The girls were rated more positively by their teachers than boys. This same pattern was seen in data for boys and girls at the start of school in Scotland and England (Tymms et al., 2014).

Quintiles and PSD

The mean scores for each PSD statement for the different quintile groups are shown in Figure 14. Although SES is preferred to Quintiles for analysis the Quintile classification is so widely used that it was thought to present data by Quintile



NB One-way ANOVA test indicated significant differences, p<.05, for just five of the 11 statements: "Upset", "Reliance", "Impulsive", "Communication – children" and "Culture"

Figure 14 Mean scores for Personal and Social Development by socio-economic status for Western Cape sample. See Section 3.1 for the list of variables

There are some clear differences by quintile for some of the areas of Personal and Social Development, but there were no consistent patterns. The behaviour at the start of the school day, "Upset", of learners from Quintile 2 was rated less positively than their peers, as was their "Reliance" and their impulsivity. However, they were rated more positively than their peers in their cultural awareness. Similarly, weak associations were found from analyses of learners starting school in England and in Scotland.

But, once again, it should be recalled that the response rates from the different groups varied and the difference seen above could be the result of differing samples or the way that the teachers rated the children.

5.3 Research Question 3: How much progress is made in the first year?

This section reports on the progress made by learners in the Western Cape sample over the course of the year. It starts with a brief outline of the data at the second testing point. The analysis begins with an exploration of missing cases and an examination of the scales to ensure that they are still psychometrically valid and reliable. An exploration of progress over the assessment points and how it varies between schools and subgroups then follows.

Sex

The gender breakdown was the same as for the baseline assessment (51.2% boys and 48.8% girls respectively).

Language spoken at home

South Africa has 11 constitutionally recognised languages and 9 languages indigenous to the continent. This can often cause mismatch between languages spoken by learners at home and the language of school instruction. In the baseline assessment, the concordance between home and instructional language was 95% for Afrikaans medium schools, 98% for Xhosa medium schools and 82% for English medium schools. The proportions attending schools with the same language medium of instruction as the language spoken at home in the follow up reflect this.

Age

The average age at the time of the second assessment was 7.41 years (Standard Deviation = 0.48) with the youngest child being 6.33 years and the oldest 10.15. The group was, on average, a little over seven months older when tested for the second time. Ideally the learners would have been assessed shortly after starting school in January and the again at the end of the school year in December but there was a delayed start because of the "Fees must fall" campaign and the university's forced closure. We could not test right at the end of the school year as testing in last term is officially prohibited; we tested as late as possible.

Missing data

7.6% of learners did not complete a follow up assessment. A series of analyses were conducted to determine if 'missingness' occurred in a systematic way. There was a small but significant correlation between SES and completing the end of year assessment (-0.11, $p<0.001$) indicating that data from higher SES homes tended to be missing. There is also some indication that learners who did not take the follow up assessment also scored lower in mathematics (by 0.67 of a logit) and reading (by 0.47 of a logit) at the start of the year.

The cognitive measures at the end of the year

Rasch modelling was used to check that scales for reading, mathematics, vocabulary and phonological awareness developed at the start of the year were applicable at the end of the year. No problems were found; in other words the items difficulties remained reasonably constant.

Reading

2,497 learners had baseline and end of year assessment scores. Progress was measured by subtracting the baseline assessment score from the end of year score. Positive values represent progress and values less than 0 show regression. Progress is illustrated in Figure 15. All schools made progress on average as did 97.5% of learners. A breakdown by groups is shown in Table 15.

Table 15 Descriptive statistics for progress in reading overall, by language medium and by sex in Western Cape sample

	n	Mean Progress	Standard Deviation	Range
All	2497	3.55	2.33	-1.19 – 15.50
Afrikaans	867	3.22	2.14	-1.19 – 14.29
English	862	3.89	2.46	-.41 – 11.95
Xhosa	768	3.53	2.32	-.15 – 12.16
Male	1273	3.37	2.28	-.35 – 15.50
Female	1224	3.73	2.36	-1.19 – 14.79

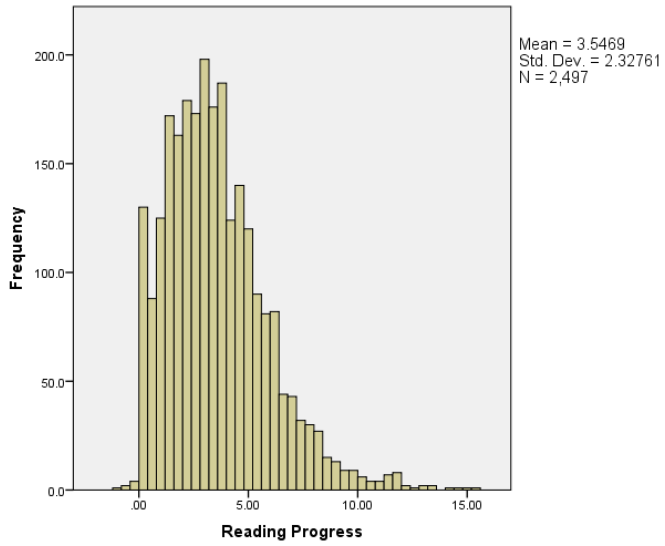


Figure 15 Distribution of Western Cape learners making progress in the reading measure

Progression pathways using the ladder (Figure 3) that was created earlier and the cumulative proportions of pupils moving through the rungs are shown in Table 16.

Table 16 Cumulative Proportions of Western Cape pupils at each ladder point at the beginning and end of year assessments in literacy

	Baseline (%)	End of Year (%)
Comprehension	1.8%	16.7%
Sentences	5.9%	40.3%
Words	39.0%	79.7%
Letters	96.5%	99.8%
Ground Level	100%	100.0%

In general, the whole the cohort made considerable progress with about 40% of learners able to read full sentences at the end of the year compared to 5.9% at the start. Whilst all learners had been able to master the ground level (100%) at the beginning and end of the year, 16.7% were able to attain the comprehension level by the end of the year.

Mathematics

Of the 2,497 learners in the sample, 2,469 learners had baseline and end of year assessment scores; (Table 17). All schools made progress and the histogram of progress in Figure 16 shows that 94% of learners made progress.

Table 17 Descriptive statistics for progress in mathematics in Western Cape sample

	n	Mean Progress	Standard Deviation	Range
All	2469	2.48	1.75	0.00 – 11.08
Afrikaans	865	2.12	1.45	0.00 – 11.08
English	838	2.46	1.68	0.00 – 9.75
Xhosa	766	2.91	2.03	0.00 – 11.08

Male	1265	2.48	1.76	0.00 – 11.08
Female	1204	2.48	1.74	0.00 – 11.08

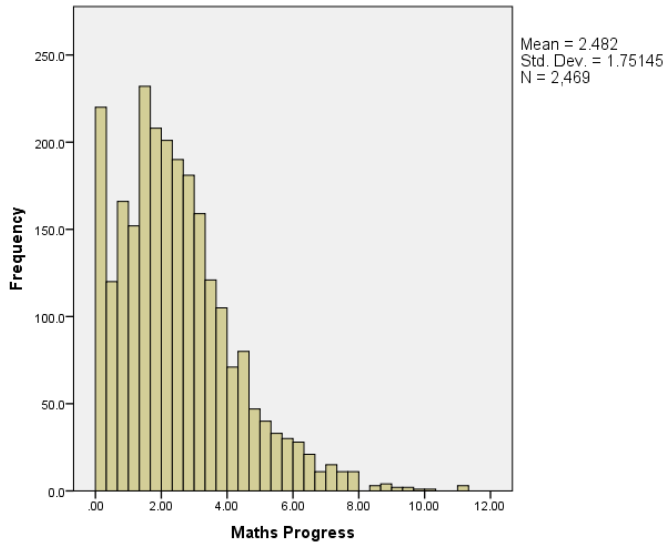


Figure 16 Distribution of Western Cape learners making progress on the mathematics measure

As with literacy, a progression pathway for mathematics was created to look at how learners move through the stages. Table 18 shows the cumulative proportions of pupils moving up the ladder shown in Figure 5.

Table 18 Cumulative Proportions of Western Cape pupils at each ladder point at the beginning and end of year assessments in mathematics

	Baseline (%)	End of Year (%)
Advanced	1.3%	10.9%
Formal Arithmetic	25.4%	68.7%
Simple Formal Arithmetic	54.2%	89.4%
Informal Arithmetic	89.4%	98.8%
Ground Level	100%	100%

Much progress was made and by the end of the year two-thirds of the learners reached the formal Arithmetic stage compared to only a quarter at the beginning of the year.

Vocabulary

Vocabulary is not part of the curriculum *per se* but it is important for the educational development of learners. Schooling helps vocabulary and it in turn helps with reading and mathematics. As noted earlier, the measures of vocabulary cannot be compared directly across languages in statistical models but general patterns can be observed across the Western Cape sample. The first point to note is that all schools saw progress, on average, in vocabulary in their respective three languages. The second point is that the vocabulary gains varied from learner to learner as Figure 17 below shows.

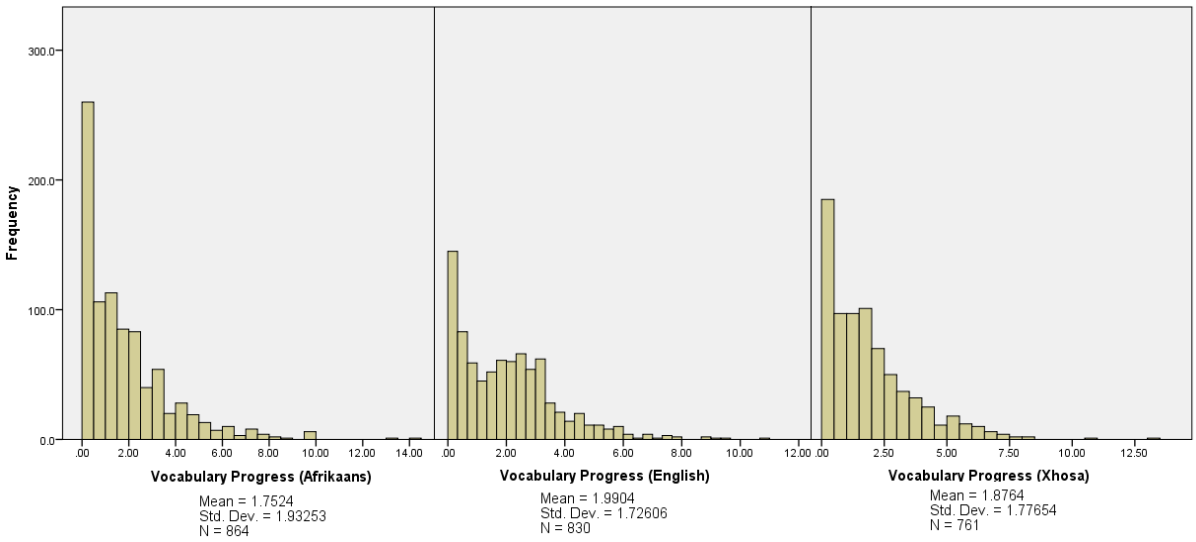


Figure 17 Distribution of Afrikaans, English and IsiXhosa learners' progress in vocabulary assessments

It is clear that in each language a proportion of learners make little or no progress. This corresponds to 24%, 17% and 17% of learners in Afrikaans, English and isiXhosa-medium schools respectively. This seems a little odd, as the young learners were seven months older and vocabulary can be expected to increase during this time with or without schooling. It may be that the assessments were not sensitive enough to detect very modest progress.

There were no significant differences in the amount of progress made between boys and girls across any of the language groups for the vocabulary measures.

Phonological awareness

As with vocabulary, phonological awareness cannot be compared across languages directly in statistical models, but general patterns can be observed across the Western Cape sample overall.

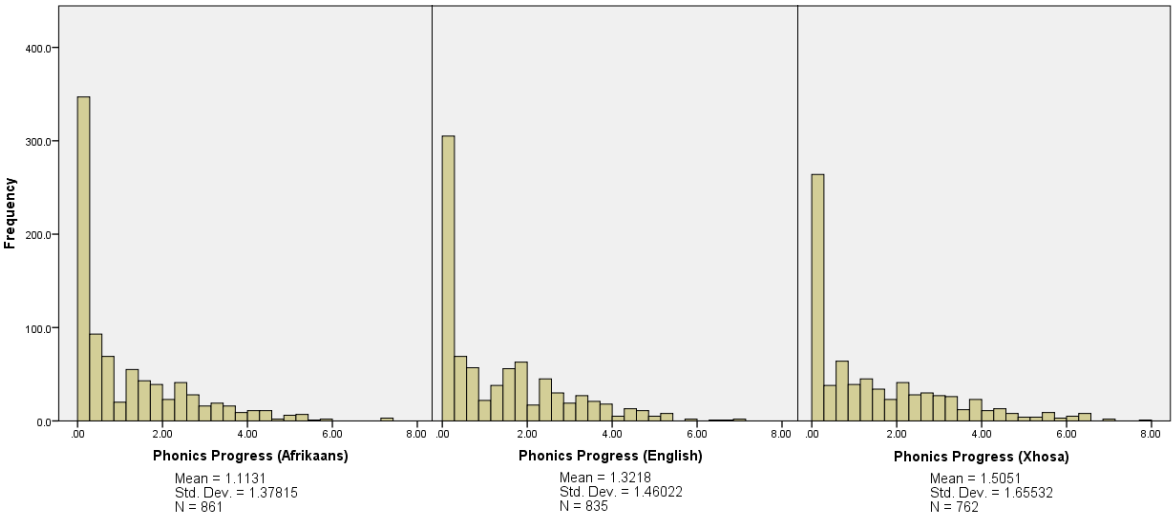


Figure 18 Distribution of Afrikaans, English and IsiXhosa learners' progress in Phonological awareness

Many learners were able to repeat words accurately and identify rhyming words at the start of the year and, therefore, did not show progress on these measures. This proportion was 40%, 37% and 35% of Afrikaans, English and isiXhosa language learners respectively. All schools, on average, made progress. There were no significant differences in the amount of progress made between boys and girls across any of the language groups for the phonological awareness measures.

Personal and social development

Of the 1,487 learners that had PSD scores from the baseline assessment, 1,247 also had data from the follow up. There was much missing data however, with the number of responses per question ranging from 878 to 1,247. There were significant biases in group representations at baseline, particularly, with more Afrikaans and isiXhosa learners than English learners and greater numbers of learners from Quintile 4 missing compared to the remaining quintiles. These biases were present in the follow-up data.

Responses to almost all questions were equally represented by gender with only two questions showing a significant difference in responses between boys and girls.

The variation and bias in these responses mean that we can only draw tentative conclusions from this dataset. There is also the added possibility of variation in teachers' severity/leniency of responses which cannot be controlled for within the existing dataset. However, the data are still worthy of inclusion in this report.

Figure 19 illustrates the results by item. Only 'Upset' and 'Communication' show a significant difference over time ($p<0.05$) with a lower end of year score suggesting students are more upset at the end of the year than at the start. We would expect children to adapt to their new environment over the first year and anxiety would be expected to decline. This result therefore seems strange and the "finding" may be a case of confusion amongst teachers. This item directly succeeds a questionnaire battery where the Likert scale proceeds in the opposite direction and it may be that teachers perhaps rate this item incorrectly. With hindsight different wording would have been useful.

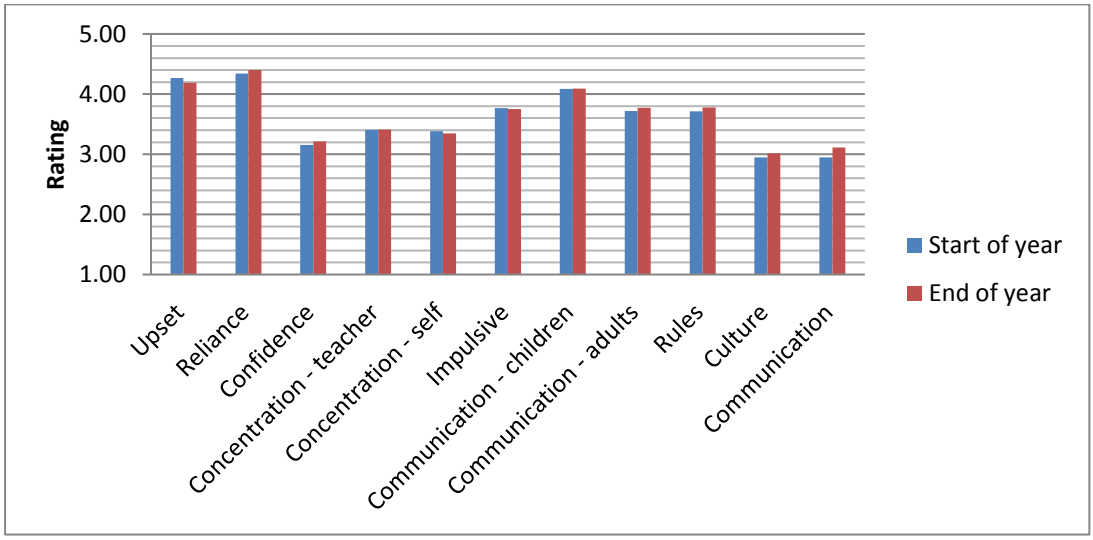


Figure 19 Mean scores for Personal and Social Development items. See Section 3.1 for the list of variables

Correlations

Earlier it was shown that all cognitive baseline measures correlated positively and significantly ($p<0.01$) in all cases). Table 19 shows that progress demonstrated the same pattern, with all measures being positively and significantly ($p<.001$) correlated. On average, learners who make progress in one measure generally make progress across other measures.

Table 19 Correlations of progress across all cognitive measures

		Reading	Maths	Vocabulary			Phonological awareness		
				Afrikaans	English	IsiXhosa	Afrikaans	English	IsiXhosa
Reading		1	.33	.17	.17	.14	.14	.13	.16
Maths		.33	1	.18	.15	.18	.16	.14	.26
	Afri	.17	.18	1			.21		
Vocab	Eng	.17	.15		1			.16	
	IsiX	.14	.18			1			.19
	Afri	.14	.16	.21			1		
Phonl.	Eng	.13	.14		.16			1	
Awar	IsiX	.16	.26			.19			1

How progress varied

In this section, we explore the end of Grade 1 results to further understand the progress and variance in reading and mathematics. To this end, missing data were first imputed, as before, and a series of MLMs were constructed. The details are reported in the Appendices. Figures 20 and 21 show the ES for each variable used in predicting the end of year results for reading and mathematics.

Reading

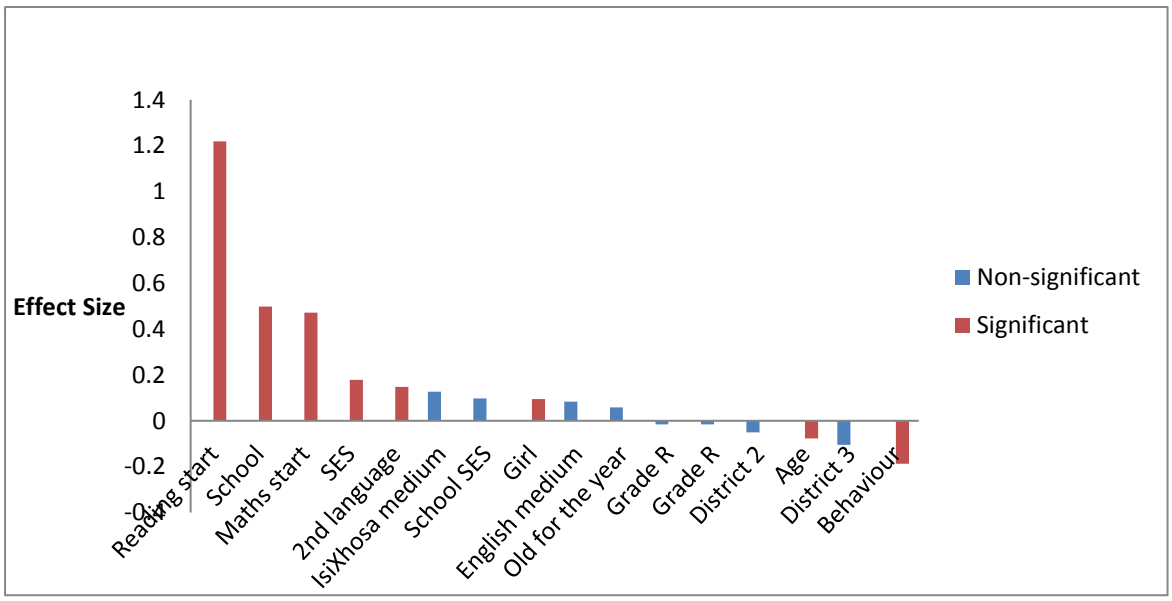


Figure 20 Effect Sizes from multi-level models for factors affecting reading at the end of Grade 1 in Western Cape sample

By far the most important predictor for the reading at the end of the year was the level of reading at the start of the year; present performance is generally best predicted by prior performance. The second most important predictor of progress was the school which the learner went to; this, at least in part, picks up how a child is taught. Interestingly, mathematics at the start of year, was also an important predictor for later reading presumably because it taps into generally cognitive functioning which is associated with academic progress. Learners from more affluent backgrounds tended to make more progress corresponding to the general educational finding that greater affluence is associated with higher attainment levels. Learners operating in their second language made significantly more progress than their peers perhaps because their initial assessments were hampered by being assessed in a second language and girls made a little more progress than boys again corresponding to the general finding that females, on average, out-perform boys in literacy.

Older learners made a little less progress than their younger peers perhaps because they missed out on age appropriate educational activities, or, perhaps because and those with behavioural difficulties made less progress. Finally, the higher the score on the rating scales for inattentiveness, hyperactively and impulsiveness (Behaviour score) the slower the progress.

Mathematics

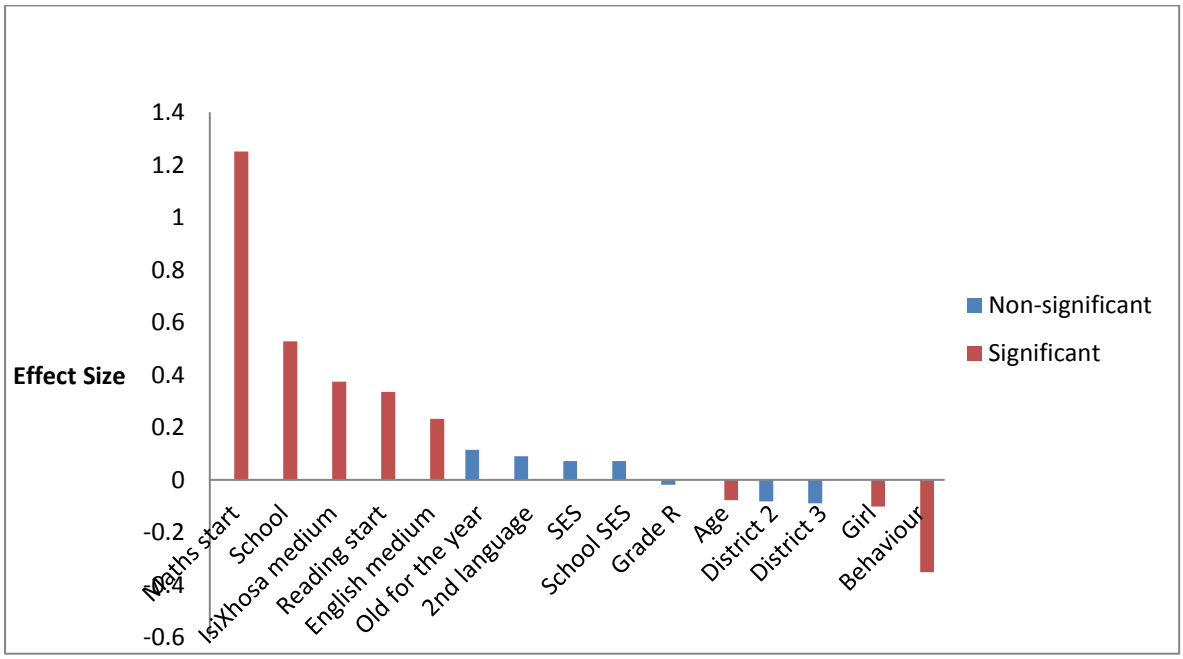


Figure 21 Effect Sizes from multi-level models for factors affecting mathematics at the end of Grade 1 in Western Cape sample

The pattern for mathematics is very similar to the pattern for reading. The strongest predictor of end of Grade 1 mathematics was early mathematics; again, prior attainment is the best predictor of future attainment. Next was the particular school attended followed by attendance at an IsiXhosa medium school. Perhaps the learners in those schools, starting from the lowest initial points found it easier to make progress. Next In importance was early reading, possibly because it provides a general indicator

of cognitive ability. English medium schools made more progress than those in Afrikaans medium schools. Girls made a little less progress than boys and the older pupils made less progress then their younger peers. The higher the Behaviour score that was recorded, the slower the progress.

Vocabulary

The MLMs for vocabulary were constructed separately for each language without imputation with the intention of running models with imputation if unexpected results were found. The models generally produced similar patterns to those found for reading and mathematics although fewer of the variables were statistically significant: there were fewer cases in each model because separate models were used for each language. The vocabulary level at the start of the year was the best predictor followed by school membership, except for IsiXhosa where there was insufficient data to distinguish schools.

For English-medium schools only, there was a significant negative coefficient for learning in a second language meaning that learners learning in English but speaking a different language at home made less progress by the end of the year.

Phonological awareness

The phonological awareness data were suited to the construction of multi-level models. A large proportion of leaders in Afrikaans and English medium school hit the ceiling when tested on "repeats" at the start of the year and for the rhyming section, a large number failed to score at all in schools of all three language mediums (Howie et al., 2016). By the time of the second assessment, as noted above, much progress had been made particular in the isiXhosa medium schools where the scores were so low. But this progress meant that more learners were essentially on top or rhyming and repeats and hit the ceiling of the test. This is not a failure of the assessment, but a triumph for the learners, and means that multi-level modelling would not be appropriate.

5.4 Research Question 4: How do the learners in the Western Cape compare with learners in England and Scotland?

iPIPS has also been used to investigate learners' cognitive development at the start of school and their progress during the first year of school with representative samples in England and Scotland. Other countries, including Brazil and Russia are also collecting data but these were not available to include in the analysis at the time of writing this report. Whilst the UK context is very different to South Africa, we nevertheless felt that it was of interest to explore differences in early childhood development.

Start of Year

Table 20 shows the reading results from the start of year assessment for the Western Cape, England and Scotland. It is clear that the children in the Western Cape start school ahead of the two UK countries. The major explanation for this must surely be age. In England, the average age was 4.5 years, in Scotland 5.0 years and in the Western Cape it was 6.8 years. The results are presented using the ladders format used previously.

Table 20 Cumulative percent of children in each category for Reading at the start of school across Western Cape, England and Scotland

	Western Cape	England	Scotland
Comprehension	1.8	0.1	0.3
Sentences	5.9	1.0	2.8
Words	39.0	10.6	21.1
Letters	96.5	91.2	96.3
Ground Level	100	100	100

A similar pattern was seen for mathematics in Table 21.

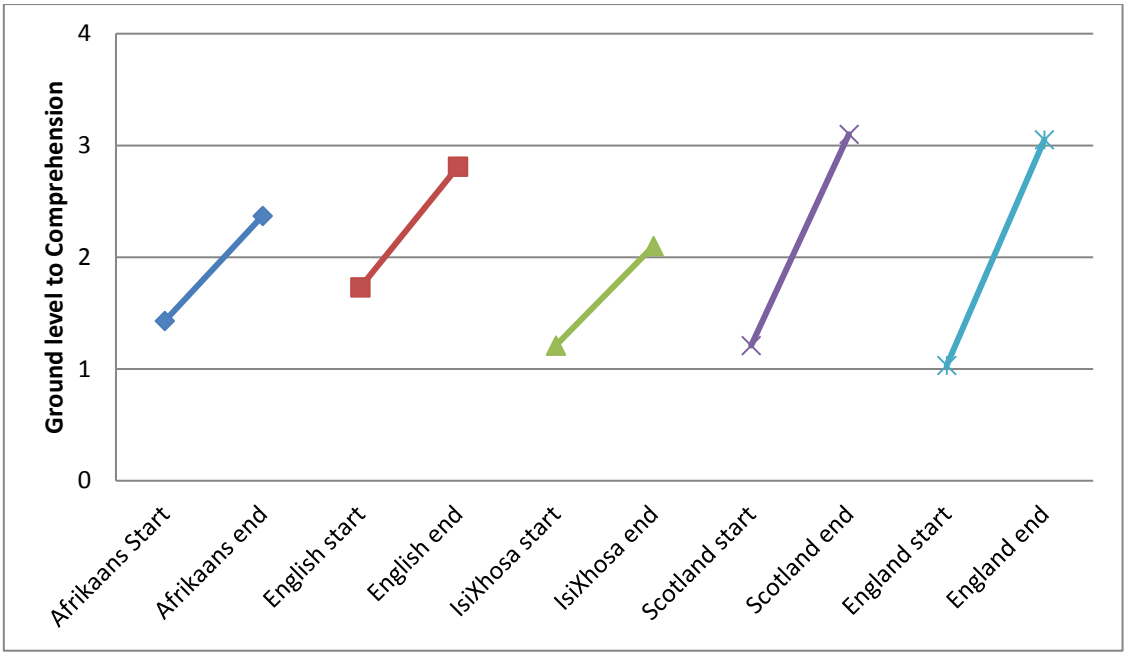
Table 21 Cumulative percent of children in each category for mathematics at the start of school across Western Cape, England and Scotland

	Western Cape	England	Scotland
Advanced	1.3	0	0.2
Formal Arithmetic	25.4	4.6	10.6
Simple Formal Arithmetic	54.2	31.5	48.0
Informal Arithmetic	89.4	93.5	97.4
Ground Level	100	99.9	100

Progress during the first year of school

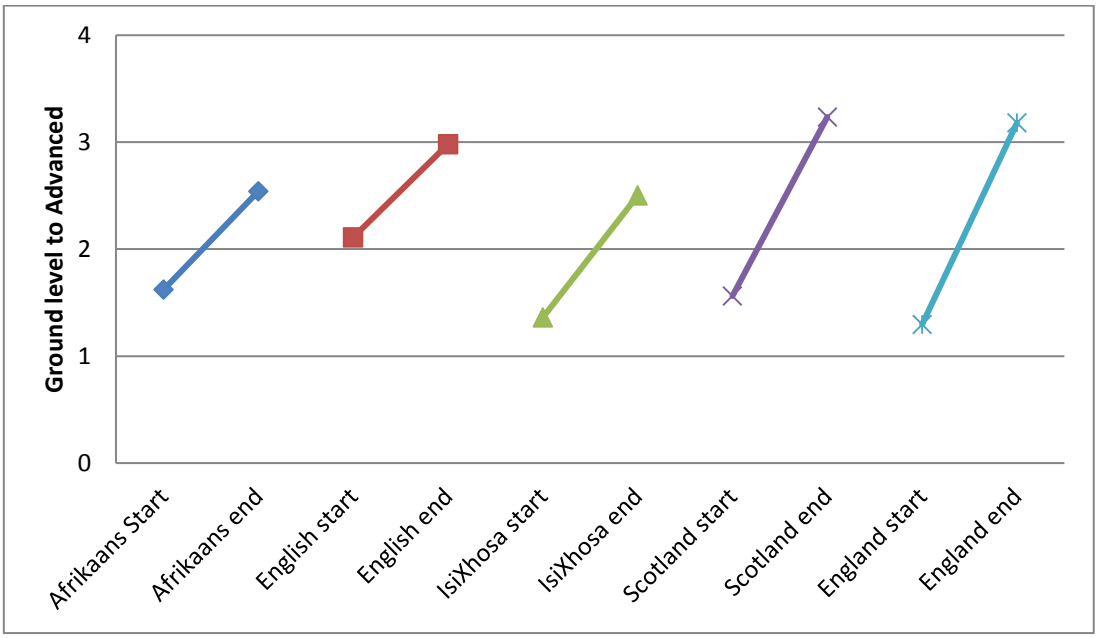
The charts below show the starting and end points for learners, in the three Western Cape languages alongside the same results for England and Scotland. The figures show learners in England and Scotland start at a lower level in reading and mathematics than those educated in Afrikaans and English. By the end of the year, the children in the UK were ahead of the children in the Western Cape. Despite these obvious differences, it is worth asserting that all groups started at a reasonable level for their age and all groups made clear progress during the first year at school.

Whilst these charts are striking, there are many reasons to treat them with caution. The children themselves are different, as are the societies. The learners started school at different average ages: 6.8 years in the Western Cape, 5.0 in Scotland (Tymms et al., 2016) and 4.5 in England (Tymms et al., 2014). They come from families with different traditions and attitudes to education (Lawson and Silver, 2013; Anderson et al., 2016; Spaull, 2013). The UK is more affluent than South Africa (OECD, 2017) which leads to different housing conditions, different levels of everyday stress, different levels of crime (Numbeo, 2017), different levels of health (WHO, 2017) and different levels of provision of pre-school education (Economist Intelligence Unit, 2012). The histories of the countries suggest that in Scotland and England it is more likely that families have a tradition of literacy and mathematics which they may attempt to pass on at an early stage. We also note that the UK data are from nationally representative samples in 2012/13, whereas the South African data are from one area in 2016. We also note that the data for South Africa represent about seven months of schooling whereas for England and Scotland it is closer to eight months at school. These are some of the reasons why the charts should be interpreted carefully. An interesting additional comparison should become available soon; the iPIPS project is collecting data in Brazil and it may provide a more meaningful perspective since the level and variation in SES is similar. The countries have parallel colonial backgrounds with large poor groups living in Townships or Favelas.



NB The Y-axis is related to the ladders in Figure 3. It gives the mean level. The Ground level is given a score of 0

Figure 22 International comparison for reading progress in Western Cape languages groups, Scotland and England



NB The Y-axis is related to the ladders in Figure 4. It gives the mean level. The Ground level is given a score of 0

Figure 23 International comparison for mathematics progress in Western Cape languages groups, Scotland and England

6. Summary of the findings

The analysis of the responses at the start and end of the year in the Western Cape sample show that children starting school in the Western Cape are very diverse. They are educated in three different languages; generally the learners are educated in the same language that is spoken at home, although a small proportion are educated in a different language to the one spoken at home, most commonly English. On entry to school, the learners are on average 6.8 years old; a small proportion were less than six years old and about 10% were much older and could have started school about a year earlier. The older learners in the cohort may have been repeating a year; we do not have information about this. The learners come from very varied socio-economic backgrounds which was best measured by the socio-economic assessment created for the project, which asked about access to amenities and learning resources. The quintile classification, which is used to allocate funds to schools, was not as useful.

The educational cognitive measures were in the areas of reading, mathematics, vocabulary and phonological awareness. Given the wide variety of backgrounds of the learners, it is not surprising to find a wide variation in the cognitive starting points of children. In reading, the range went from about 3% who had not reached the first rung on the ladder towards full literacy to about 2% who were reading and understanding complex texts. In mathematics, a similar range was observed with about 10% at the stage of counting a few objects by rote to about 1% who could deal with complex arithmetic. The project also asked teachers to rate their students on personal and social development and that generally produced positive responses with most learners communicating well, not relying on others and being happy at school. It should be noted that this was based on teachers' judgements and may have been prone to bias with some teachers rating the characteristics of their learners more leniently than others. However, looking at the results for groups provides interesting information about differences in development between areas such as confidence compared with concentration, and between groups of learners.

Many learners learning in English and Afrikaans had mastered the skills of phonological awareness when they started school, but some had not and in isiXhosa-medium schools, a high proportion were not able to identify rhymes, although this could be because of translation issues.

Two additional key variables were whether the child had attended Grade R and a measure of inattentive, hyperactive and impulsive behaviour using ratings by the teachers. It was clear that the behaviour ratings suggested a higher level of difficulties amongst learners in the Western Cape than is generally found internationally. It could be that the severity of the raters' judgments account for the differences, and further research could confirm this, but the scores were so high that this seems unlikely.

MLMs were constructed to see which variables were most related to the starting levels in reading and mathematics. Just a few factors were statistically significant and of substantive importance for both outcomes. They are: the socio-economic background and neighbourhood of the learners, the behaviour ratings given by the teachers in the first term and attendance at Grade R. Socio-economic background reflects the access to resources outside of school and environments where resources are more abundant such as access to the internet and books are likely to contain richer opportunities for learning than environments with scarce amenities (Bourdiey and Passeron, 1990). Attending school

one year earlier in the Reception class provides educational input at a stage that is so important to early childhood development. The link between inattention and educational attainment and progress is well documented and the results of this study showed a similar pattern.

At the end of the year, similar models were constructed with end of year scores as the outcome. Common to both outcomes (reading and mathematics), start of year scores were the most dominant predictors of end of year scores; this is not unexpected as the best predictor of present performance is generally past performance. The importance of school membership and behavioural difficulties should also not be understated. Which school a child went to, and, more specifically, which teachers taught the learner, are important factors in the progress.

The rating of personal and social development at the end of the year were similar to those at the start of the year.

7. Conclusions

iPIPS is operating in a rapidly changing country and it makes sense to start this section with some comments about the context. South Africa is experiencing an unprecedented number of assessments on a systemic level across the country. The programme of Annual National Assessments (ANAs), implemented since 2009, has raised the ire of teachers countrywide regarding their use for political accountability as opposed to educational use and concerns about their quality, use and cost have been widespread amongst academics (Howie et al., 2016). Unfortunately, the unintended consequences emanating from ANAs have impacted on other initiatives related to assessments as schools and teachers are suspicious of and even resistant to implementing further assessments. iPIPS differs significantly from these and other assessments at the Foundation Phase (Grades 1-3) in its comprehensive approach to assessing early learning of specific abilities and in its goal of measurement across an academic year providing schools and teachers with information about the status of each child across multiple measures both at the beginning and end of year rather than a cross-sectional assessment which broadly covers the curriculum.

7.1 Research Question 5: What implications do these analyses have for policies in the Western Cape?

There are a number of policy implications arising from the study and they focus on alterable variables.

- The significant factors which best predict the cognitive start points on entry level to Grade 1 include one obvious educationally alterable variable and that is attendance at Grade R. If the proportion of learners going to Grade R could be increased this would surely be of benefit.
- The analysis presented in this report suggests that progress varied from school to school even after controlling for the home background of learner, the schools' locations and medium of instruction. If all schools could make the same progress as the "best" the whole system would be transformed. We are unable to provide a recipe for success based on this study but the starting point would be an efficient monitoring system which can help identify the best.
- A third potentially alterable variable is not under the direct control of educationalist. It relates to the very high ratings of inattention, hyperactivity and impulsivity. Although these are subjective ratings, and we must be cautious about interpretations, the higher the rating the lower the initial cognitive scores of learners and the slower the progress during the first year at school. When put alongside the independent evidence for a high rate foetal alcohol syndrome in the Western Cape it raises concern about the health of pregnant mothers.
- A requirement of the Nuffield award was that the assessments used during the project would, subsequently, be made "free at the point of use". With that in mind it is interesting to note that during three meetings with principals and teachers, there were spontaneous requests for access to the iPIPS assessment so that the teachers can understand and help the learners at an early stage. It would be possible to provide an abbreviated version of iPIPS which would be paper-based and cost effective. This would be administered and analysed by schools across the Western Cape.
- Finally, we note that older learners tended to make slower progress and we are concerned that they will be drawn into other activities before they become fully literate or numerate if they simply missed the start for a variety of reasons. It may be that some are repeating a year.

Whatever the reason, successful efforts to get the 10% of older learners into school a year earlier or to move up a year should bear fruit.

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Appendix

In this appendix, we provide a detailed overview of the reading and mathematics questions as they appear on the Rasch scales used throughout this report. Each item map illustrates the position of each question in the assessment on a logit scale relative to the ability of each learner. Using this we then created cut off scores at points where a shift in understanding has likely been made (i.e. letters to words, words to sentences etc.). These conceptual stages are used for the purposes of reporting to teachers and parents as they allow us to describe pupil progress in a meaningful way that does not require an understanding of the complexities of Rasch measurement.

The item/learner maps for reading and mathematics with cut-scores used in the ladder are shown below.

Item learner maps and cut points for the ladders

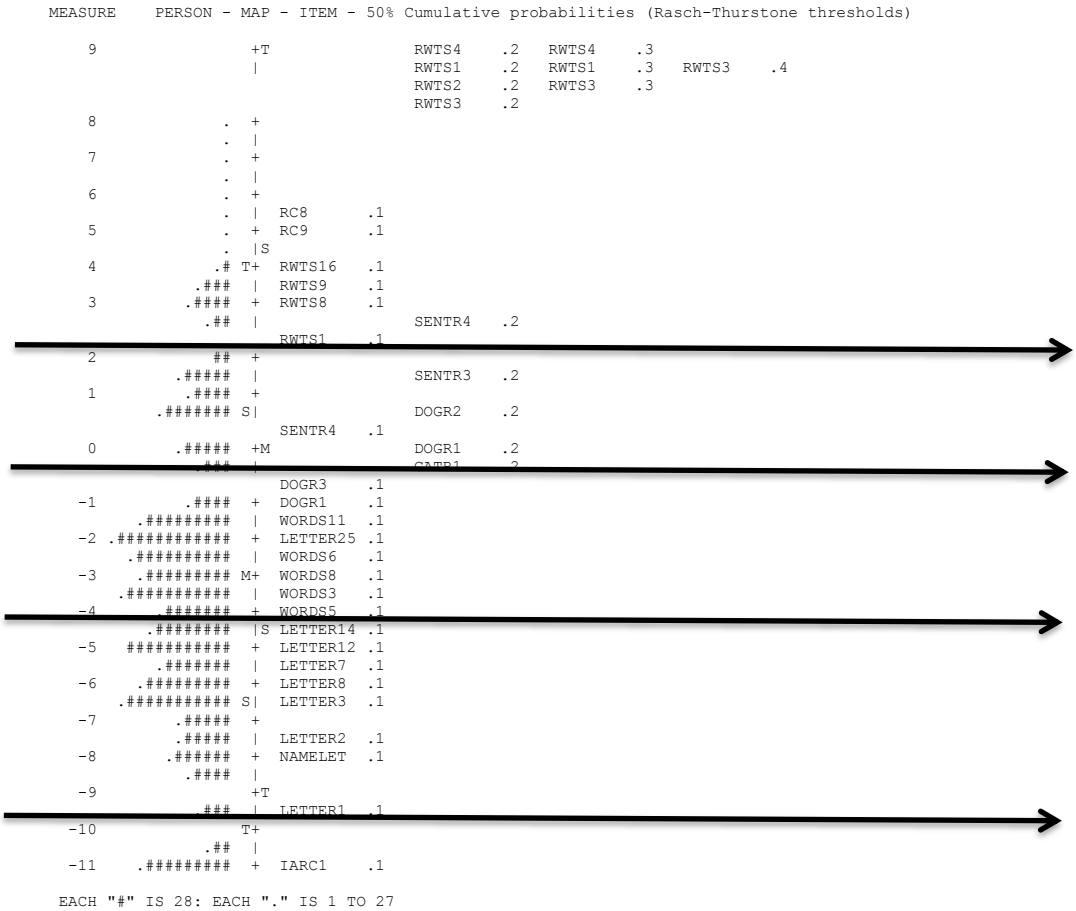

Figure A1 Learner/item map for reading (start and end) in S. Africa with cut-scores

Cuts at -9.8, -4.2, -0.5 and 2.1

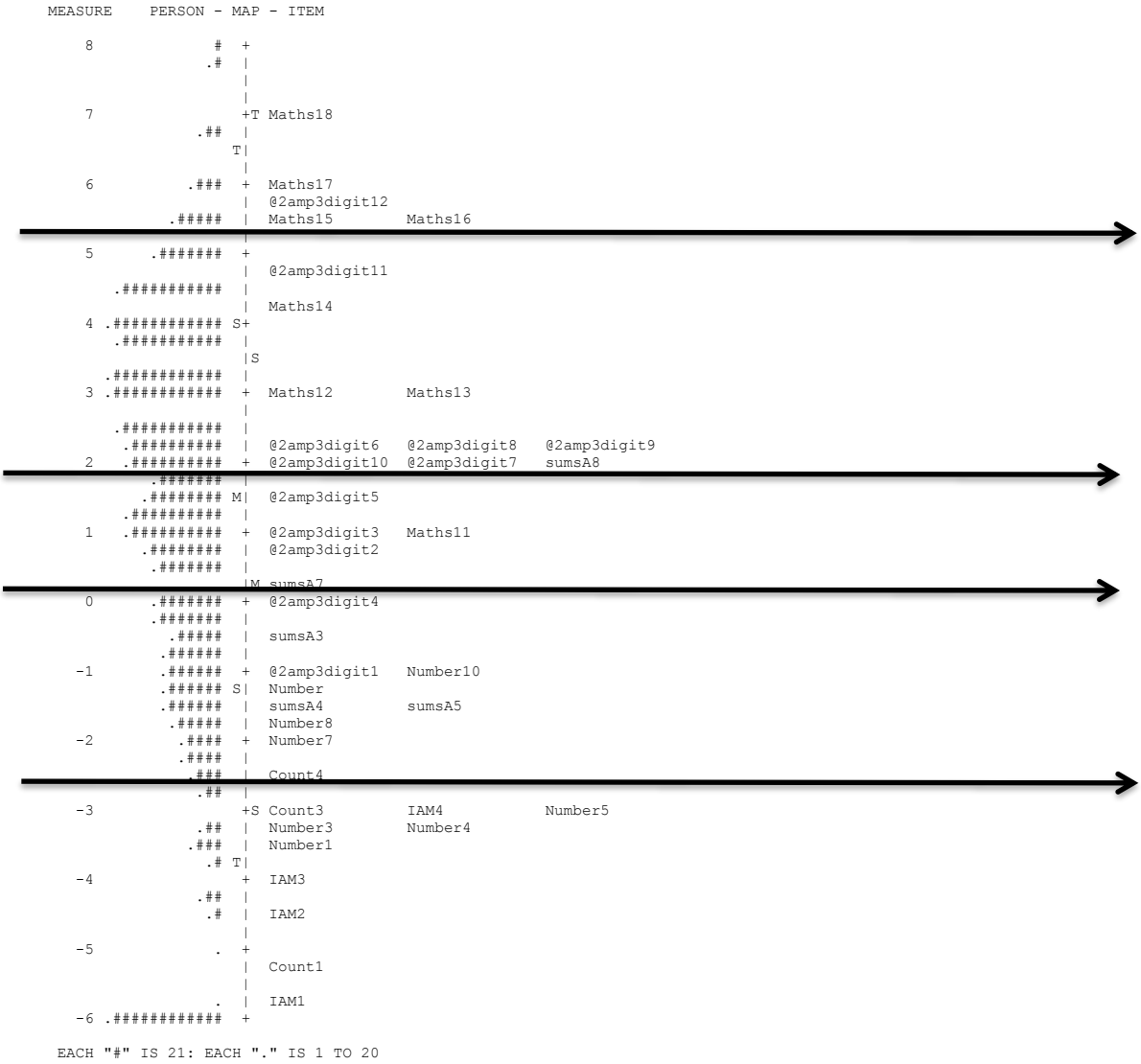

Figure A2 Learner/item map for reading (start and end) in S. Africa with cut-scores

Cuts at -2.8, 0.1, 1.8 and 5.2

The two tables below indicate how the cut-scores were chosen for the two measures. These cut scores were used to create easy to understand progress ladders. The progress ladder allows us to group children by a level of ability in a language that can be understood by practitioners and parent, rather than simply classifying children by an actual Rasch value or range. There is inevitably a degree of arbitrariness in the precise choice of cut-score but that is thought to be worthwhile give the advantages of grouping.

Table A1 The guiding principles behind the cut points are shown below

Reading: Start at the bottom and work up	
Comprehension	Higher
Sentences	Below a 50:50 chance of scoring points on a reading passage
Words	Below a 50:50 chance of reading a sentence
Letters	Below a 50:50 chance of knowing the easiest word
Ground Level	Below a 50:50 chance of knowing the easiest letter

Table A2 The guiding principles behind the cut points are shown below

Mathematics: Start at the bottom and work up	
Advanced	Higher
Formal Arithmetic	Below the ability to calculate 105+302 or Sum B15
Simple Formal Arithmetic	Below the ability to identify 3 digit numbers
Informal Arithmetic	Below a 50:50 chance of identifying a 2 digit number or doing a formal sum
Ground Level	Below a 50:50 chance of identifying a number above 5

Imputation and multi-level models

For both the start of year and end of year data there is a need to combine all the predictor variables together in a single model and to account for the hierarchical nature of the data. To this end multilevel-models (MLMs) were employed (see for example Raudenbush & Willms (1995) using MlWin version 2.36.

There were missing data, and in particular the proportions of missing data for SES (35%). For Behaviour at the start and end of year data were available for a random sample of 68% with just 16% missing at the start and end of the year. Further the data were not spread evenly across the sample. Technically the data were Missing Not at Random (MNAR). We know this because the missing data were, for example, disproportionally from learners with lower starting mathematics scores. The differences range from small to large across the outcome of interest. However, the missingness in the data should be considered non-ignorable and these cases should thus be included. On balance, it was thought better to impute data and to produce as robust estimates as possible so that we could continue to use the full sample. The technique chose was the automatic option for multiple imputation in the SPPS software version 21 (Raghunathan et al., 2001). This employs a variety of statistical techniques including multiple linear regression and logistic regression employing all the data available in five iterations. The MLMs used the pooled data from the iterations which provides us with conservative estimates for the missing cases. All the MLMs were checked against MLMs without imputation and without missing data to ensure that similar conclusions were drawn.

The MLMs are reported below:

Table A3 MLM for start of year Reading

Fixed	**Null**	**Full**
Cons	0.025(0060)	
English medium		-0.267 (0.160)
IsiXhosa medium		-0.161 (0.111)

Girl		0.033 (0.030)
2nd language		-0.069 (0.055)
Old for the year		0.031 (0.052)
District 2		-0.032 (0.097)
District 3		-0.201 (0.070)
SES		0.104 (0.020)
Age		0.104 (0.021)
School SES		0.536 (0.113)
Behaviour start		-0.296 (0.017)
Grade R		0.196 (0.044)
Random		
School	0.208 (0.034)	0.162 (0.026)
Learner	0.791 (0022)	0.560 (0.015)

Figures in parentheses are Standard Errors
All continuous variables were standardised to aid interpretation

Table A4 MLM for start of year mathematics

Fixed	**Null**	**Full**
Cons		
English medium		-0.285 (0.143)
IsiXhosa medium		-0.279 (0.098)
Girl		-0.12 (0.032)
2nd language		-0.109 (0.058)
Old for the year		0.101 (0.054)
District 2		-0.046 0.086)
District 3		-0.097 (0.069)
SES		0.15 (0.021)
Age		0.072 (0.022)
School SES		0.379 (0.102)
Behaviour		-0.323 (0.017)
Grade R		0.212 (0.045)
School	0.263 (0.041)	0.117 (0.020)
Learner	0.748 (0.021)	0.623 (0.017)

Figures in parentheses are Standard Errors
All continuous variables were standardised to aid interpretation

Table A5 MLM for end of year Reading

Fixed	**Null**	**Full**
Cons	0.026 (0.053)	
English medium		0.072 (0.095)
IsiXhosa medium		0.119 (0.095)
Girl		0.082 (0.024)
2nd language		0.129 (0.043)
Old for the year		0.048 (0.040)
District 2		-0.044 (0057)

District 3		-0.091 (0.048)
SES		0.078 (0.016)
Age		-0.067 (0.016)
School SES		0.064 (0.068)
Behaviour start		-0.125 (0.014)
Grade R		-0.014 (0.033)
Random		
School	0.25 (0.040)	0.047 (0.009)
Learner	0.756 (0.021)	0.342 (0.009)

Figures in parentheses are Standard Errors
All continuous variables were standardised to aid interpretation

Table A6 MLM for end of year mathematics

Fixed	**Null**	**Full**
Cons		-0.143 (0.072)
English medium		0.207 (0.102)
IsiXhosa medium		0.333 (0.070)
Girl		-0.091 (0.025)
2nd language		0.080 (0.045)
Old for the year		0.101 (0.042)
District 2		-0.073 (0.061)
District 3		-0.079 (0.051)
SES		0.032 (0.017)
Age		-0.069 (0.017)
School SES		0.048 (0.073)
Behaviour start		-0.156 (0.014)
Grade R		-0.017 (0.035)
Random		
School		0.055 (0.010)
Learner		0.375 (0.010)

Figures in parentheses are Standard Errors
All continuous variables were standardised to aid interpretation