Roots and Shoots

BASELINE REPORT

Research from
early learning to
school outcomes

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mr price foundation

1. About the Roots and Shoots study

1.1. Background to the study

It is now widely acknowledged that most South African learners do not acquire foundational literacy and mathematics by the end of Grade 3[1] and that this is one of the binding constraints to progress in South Africa[2]. While we know that poor-quality schooling certainly contributes to these poor schooling outcomes, evidence from a wide range of disciplines including biology, human development, educational psychology, cognitive science and economics has shown that there is a strong link between the skills that children enter school with and their later outcomes[3]. Recognising this evidence, there has been a global effort toward investing in early childhood as a strategy for improving children's later life outcomes.

Despite this evidence, we still know very little about the skill formation of learners growing up in the global South, where low quality schooling often dominates explanations for learners' poor educational outcomes, and crowds out other potential explanations such as low levels of school readiness among children when they enter school. The Roots & Shoots study aims to fill this gap by measuring a sample of South African children's early skills as they enter school, and following them across time to understand the link between these early skills and later schooling outcomes. By collecting data on children as they first enter school and then following these same children over time, we can determine to what extent the patterns of performance seen in Grade 3 can be traced back to trends already there on the first day of school.

The Roots & Shoots study aims to answer the following questions:

- What are the foundational skills levels of learners when they first enter school?

- To what extent can the patterns of performance seen in Grade 3 be traced back to trends already there on the first day of school?

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1   Spaull & Pretorius (2019)
2   Van der Berg et al. (2016)
3   Heckman (2011); Hackman and Farah (2009); Sánchez (2017).

1.2. Renewed emphasis on early childhood development by the DBE

An important development over the last two years is that Early Childhood Development (ECD) is in the process of being moved from the Department of Social Development (DSD) to the Department of Basic Education (DBE), with the function transfer taking effect in 2021. This means that decisions about certification, training and funding will be made by the DBE. Since taking over ECD, the DBE has already conducted two noteworthy projects that improve our understanding of how the ECD sector functions. In 2020/21 the DBE conducted the 'ECD Census' (DBE, 2021) which is a list of all ECD centres in the country, with background information on them. Furthermore, in September and October 2021 the DBE together with Innovation Edge collected data for Thrive by Five (Giese *et al.*, 2022), which measured the early learning skills of a nationally representative sample of five-year-olds enrolled in ECD centres in 2021. These projects illustrate the renewed importance placed on understanding early learning outcomes by the DBE. The Roots & Shoots study is therefore well-timed to contribute meaningfully to this new research agenda on early learning.

The Roots & Shoots study aims to add to the evidence produced by the Thrive by Five study by creating a longitudinal database of learners as they progress through school. While Thrive by Five has provided crucially important information on more than 5,000 young children across the country, the data is cross-sectional, meaning that it is not aimed at following the same learners over time. Roots & Shoots will therefore complement existing studies such as Thrive by Five by providing evidence of the learning trajectories of individual learners as they progress through the schooling system.

2.   Acknowledgements

3. Executive summary

The results presented in this baseline report show that there is much we do not understand about how the skills that children enter school with are translated into learning outcomes. This report constitutes the first step in the first local study that will follow the same children from the start of formal schooling as they move through the primary school grades. The baseline results show that while there are clear socio-economic status differences in children's readiness to start formal schooling, there is also much variation in early learning skills within socio-economic status groups, and even within the same classrooms. Following these learners across time will provide the first local evidence of the learning trajectories of children who start school with different levels of early learning skills. The main results of the baseline report are as follows:

Many children in the Roots & Shoots sample start formal schooling with a backlog in early skills, with 38% of sampled Grade R learners not meeting the standard for being developmentally on-track. This provides strong evidence that many children start school without the skills needed to learn effectively. The Grade R curriculum assumes that children starting formal schooling already have certain foundational skills, such as oral language. Children who are developmentally behind when starting school are therefore not prepared to meet the demands of the curriculum.

There are socio-economic status differences in early learning scores. Specifically, the baseline results show that learners attending schools that charge higher fees far outperformed learners in no-fee and low-fee schools in the early learning assessment. This is strongly suggestive that the large achievement gap between poor and wealthy children in South Africa can partly be explained by the fact that poorer children, on average, start school less prepared for the demands of adjusting to the formal schooling environment than do their wealthier counterparts. In essence, the results presented here suggest that the same phenomenon observed in many countries around the world, namely of "inequality at the starting gate", is part of the reason for South Africa's highly unequal education outcomes in later grades.

There is much variability in the skills children start school with, even within the same classrooms. This poses immense challenges for teachers, since it is not clear at what level they should pitch their lessons. In addition, this result raises important questions about the trajectories of learners in the same school who start school with varying levels of skills. Only once the Roots & Shoots longitudinal data is available will it be possible to determine what happens to the learning trajectories of learners in the same schools who start school developmentally on track, falling behind, or falling far behind where they should be.

4. Introduction

There is a dearth of local evidence on the links between the skills that children enter school with and later reading achievement. There are, however, a handful of studies that have assessed the early skills of children and which provide some indication that South Africa's poor literacy outcomes may find their roots in the early years. The most notable study in this regard is the *Thrive by Five Index Report* (Giese *et al.* 2022), which, using the ELOM, assessed the early learning skills of a nationally representative sample of five-year-olds enrolled in early childhood development (ECD) centres in 2021. The study found that 65% of children attending an ECD centre in South Africa are falling behind developmentally, in terms of cognitive and/or physical development. 55% of children were falling behind in early learning specifically – that is, more than half of South African five-year-olds enrolled in ECD centres were not able to do the learning tasks expected of children their age.

The Thrive by Five Index report also found evidence of a strong socio-economic status (SES) gradient to performance in the ELOM, with children from low-SES households performing significantly worse than their high-SES peers. The authors conclude that "[b]efore they even enter their first school classroom, most poor children in South Africa face significant barriers to success" (Giese *et al.* 2022: 5). Considered together with evidence from the international literature that skills gaps in childhood widen over time (van Poortvliet 2021), the fact that more than half of South African five-year-olds are falling behind developmentally, and that there are large SES differences in early learning, are strongly suggestive that the foundations for the country's poor educational outcomes are laid long before the start of formal schooling.

This report aims to add to this evidence by presenting data on early learning outcomes for a sample of Grade R learners in the Western Cape. The evidence presented in this report, although not nationally or provincially representative, builds on the evidence of the early roots of reading failure presented in the Thrive by Five Index Report by investigating the nature of variation in early learning scores within and across schools, and linking school-level learning outcomes in Grade R to outcomes in Grade 1, 4 and 7 in the same schools. While this data is not yet longitudinal – i.e. it does not follow the same learners over time – the evidence presented in this report constitutes the first attempt at linking school-level achievement in Grade R with achievement in later grades in the same schools. As such, this report is the first attempt to link early learning outcomes with South Africa's poor learning outcomes in later grades.

5. Study design and methods

5.1. Sampling

5.1.1. The Afrikaans sample

The initial round of the Roots & Shoots study took advantage of an existing research study that collected achievement data on children in Grades 1, 4, and 7 in 100 primary schools in the Western Cape that had Afrikaans as their official language of learning and teaching (LoLT). The aim of that study was to measure the impact of an intervention jointly implemented by a Non-Governmental Organisation (*Funda Wande*) and the Western Cape Education Department (WCED) that targeted foundational literacy and numeracy in 50 treatment schools, whose outcomes were compared with 50 comparison schools. Within each educational district, statistical techniques were used to select the comparison schools such that they matched the treatment schools as closely as possible on performance on the Grade 3 systemic assessments[4] from 2017 to 2019. Roots & Shoots assessed the early learning skills of Grade R children as they entered formal schooling (i.e. in Term 1) in 50 schools that were part of the evaluation study (i.e. half of the schools in the *Funda Wande* evaluation study). These schools are all located in the four Metro and Cape Winelands educational districts (i.e. five of the eight districts in the province). We aimed to assess eight randomly selected Grade R children in each school, that is, 400 Afrikaans LoLT children. 24 assessments were conducted with children who were older than the cut-off point of 69 months, and these children were not included in the final sample. An additional three assessments were deemed invalid due to the child missing a score on one or more of the ELOM domains, and were also excluded from the analysis. The final Afrikaans LOLT sample consisted of 388 children.

A major advantage of the Roots & Shoots data is that Grade 1, 4, and 7 learners in the same schools were assessed as part of the Funda Wande intervention evaluation. As a result, it is possible to compare the achievement of Grade R learners in the 50 Afrikaans schools with the Term 1 achievement of Grade 1, 4, and 7 learners in the same schools. Two of the schools only had classes up to the end of Foundation Phase and the final sample consists of 980 Grade 1 learners, 483 Grade 4 learners, and 488 Grade 7 learners.

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4   These are standardised assessments conducted province-wide on an annual basis by the WCED.

5.1.2. The isiXhosa sample

In addition to the 50 Afrikaans schools, Roots & Shoots assessed Grade R children in 25 isiXhosa LoLT schools in the Western Cape. Only schools in the Cape Town Metro districts were considered since most isiXhosa LoLT schools in the Western Cape are located in Cape Town. The sample frame was further restricted to schools with at least 30 Grade R and 30 Grade 1 learners and excluded schools that had participated in the *Funda Wande* pilot in 2021. Schools were stratified in quintiles of their average Grade 3 Systemic Evaluation performance between 2017 to 2019 and then within each stratum, five schools were randomly selected. The final isiXhosa LoLT sample consisted of 199 Grade R children.

5.2. Measures

5.2.1. The ELOM instrument

There are currently two ELOM assessments, one for children aged 4-5 years (ELOM 4&5), and one for children aged 6 and 7 years (ELOM 6&7). Grade R children's early learning skills were assessed using ELOM 4&5, while Grade 1 learners were assessed using ELOM 6&7. ELOM 4&5 is aligned with the South African Early Learning Curriculum Framework and was developed and standardized for use with children in two age groups: 50-59 months and 60-69 months. The ELOM 4&5 has 23 items clustered in five domains:

- Gross motor development (GMD);

- Fine motor coordination and visual motor integration (FMC-VMI);

- Emergent numeracy and mathematics (ENM);

- Cognition and executive functioning (CEF); and

- Emergent literacy and language (ELL).

A child's performance in each of the five ELOM 4&5 domains is awarded a raw score, which is then transformed into a scaled score. In each domain, item scaled scores are summed to provide a domain total score out of 20. The five domain scores are then summed to derive the ELOM 4&5 total score out of 100. The ELOM technical manual specifies the cut-off points on each domain, as well as on the overall ELOM assessment, that are associated with being "on track", "falling behind", and "at risk" for each age group. Adopting the terminology used by the Thrive by Five study (Giese *et al.*, 2022), we call these categories "on track", "falling behind", and "falling far behind", respectively.

5.2.2. Physical growth

Growth status is measured as the child's height-for-age, using a stadiometer. The measurement is compared with the expected standard for height-for-age using the World Health Organisation Multicentre Growth Reference Study Group, 2006. Height-for-age measures compare height against a healthy reference population and allow one to identify when a child is at risk of stunting. Stunting is a long-term condition that reflects poor overall health status of the child and usually results from chronic malnutrition in utero and in early childhood[5].

5.2.3. Grade 1, 4, and 7 assessments

In the Afrikaans schools, assessments were also conducted with learners in Grade 1, 4 and 7. Learners in Grade 1 were assessed using selected items from the literacy and numeracy domains of the ELOM 6&7 Assessment. This tool was developed by Innovation Edge in response to the need to measure developmental outcomes for children aged 69 to 89 months and to provide an indicator of the percentage of children ready for Grade 1. Data collection at the Grade 4 and 7 level was conducted in collaboration with DBE for the purpose of establishing early grade reading benchmarks in Afrikaans. Assessors conducted one-on-one Early Grade Reading Assessments (EGRA) and administered group written comprehension and vocabulary tests.

5.3.   Fieldwork

Data for the study was collected in March and April 2021 by a team of fieldworkers managed by ikapadata. Assessors were all ELOM-accredited assessors who attended a one-day refresher training before the fieldwork commenced. Pre-fieldwork preparation included pre-visit calls to introduce the research to the school principal and to assess whether the school qualified for inclusion in the sample. Consent forms were distributed to all participating schools in the month preceding fieldwork, to be sent home to caregivers. Assessments took place at the schools, in a quiet space away from other children. Each assessment took approximately 45 minutes, and every child was assessed in their home language. Assessors were trained on, and expected to adhere to, Covid protocols. This included daily health checks, wearing of masks at all times, and sanitizing of equipment. Ethical clearance for the study was obtained from the University of Cape Town's Commerce Faculty, and permission to conduct research in schools was granted by the WCED's Directorate of Research.

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5   Dewey and Begum (2011), and for South Africa specifically see (Casale, 2016).

5.4. The final sample

The final sample consisted of 587 Grade R children from 75 schools. Details about the final sample are presented in Table 1. The Roots & Shoots sample therefore differs from the Thrive by Five sample in that, in addition to not being either nationally or provincially representative, the majority of children in the Roots & Shoots sample are 60-69 months old, whereas the majority of children in the Thrive by Five sample are 50-59 months old. When comparing findings across the two studies, it is therefore important to keep in mind that two different age groups are being compared.

Table 1: Characteristics of final Roots & Shoots sample

		N	Percentage
Age	50-59 months	20	3%
	60-69 months	567	97%
Sex	Male	293	50%
	Female	294	50%
Home language	Afrikaans	388	66%
	isiXhosa	199	34%
Quintile	1	41	7%
	2	128	22%
	3	144	25%
	4	164	28%
	5	110	19%
District	Cape Winelands	117	20%
	Metro Central	56	10%
	Metro East	216	37%
	Metro North	127	21%
	Metro South	71	12%

5.5. School quintiles

While the Funda Wande intervention aimed to focus on Quintile 1-3 schools, the list of schools provided by the WCED included Quintile 4 and 5 schools, which are usually fee-charging schools. This selection of schools across all quintiles was advantageous for Roots & Shoots as it allows for meaningful comparison across quintiles informing our understanding of the links between school readiness and SES. The distribution of learners and schools across the official DBE quintile ranking of schools is shown in Table 1. The table shows that nearly half (47%) of the sample consists of Quintile 4 and 5 schools, and that only a very small proportion (8%) consists of Quintile 1 schools. (Note that as a province, the Western Cape does not have a large percentage of Quintile 1 schools.) Upon further investigation, however, it is clear that the official DBE quintile rankings of schools are not a true reflection of the fee status of schools in the sample. This can be seen in Figure 1, which shows the annual school fees as reported by the school principal by quintile of each school in the sample. It is clear from the figure that while there are some Quintile 5 schools charging in excess of R3,000 in school fees per year (seven schools), there are many Quintile 4 and 5 schools that charge very low fees, or even no fees. The figure reveals that 17 out of the 21 Quintile 4 schools (81%) and two out of the 14 Quintile 5 schools (14%) are no-fee schools, while remaining four Quintile 4 and remaining five Quintile 5 schools charge less than R3,000 per year. In total, 55 out of the 75 schools (73%) in the sample are no-fee schools, of which 19 schools (35% of no-fee schools) are Quintile 4 or 5 schools.

Figure 1: Annual school fees by school quintile
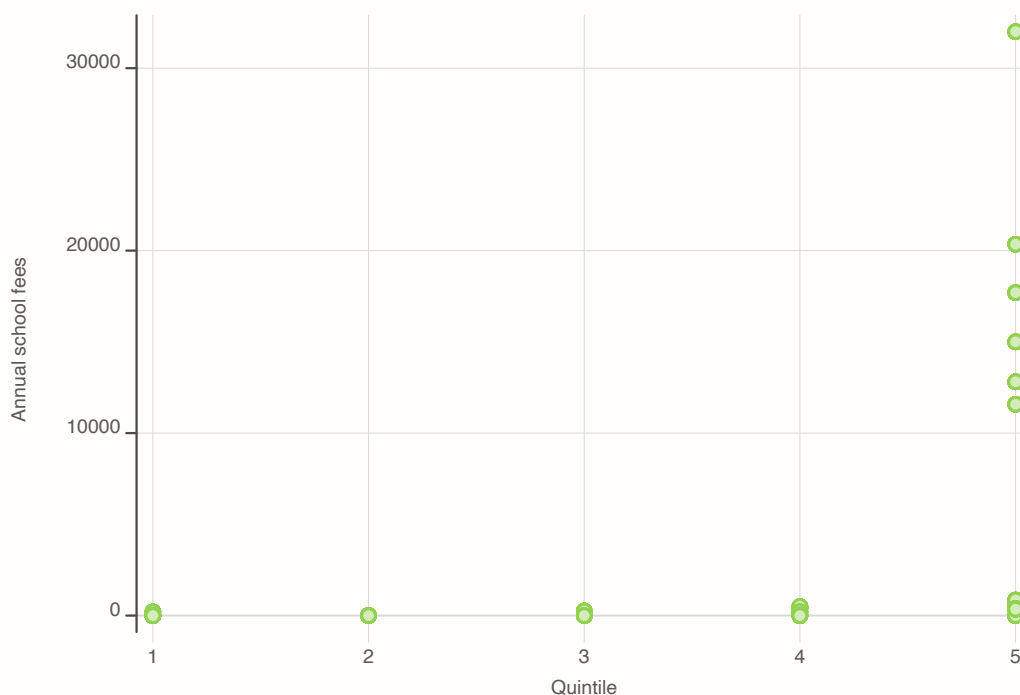
Further analysis reveals that the seven schools charging fees in excess of R3,000 have substantially better learner performance as measured by the 2017 to 2019 Grade 3 systemic assessments. Table 2 shows the average standardized systemic score for schools grouped into three bands of school fees: no-fee schools; low-fee schools (schools with fees lower than or equal to R3,000 per year); and mid-fee schools (schools with fees higher than R3,000 per year). The difference in performance between the group of mid-fee schools and those schools charging no or low fees is striking. On average, these mid-fee schools have systemic scores that are between 4.2 and 4.7 standard deviations higher than other schools in the sample.

Table 2: Average Grade 3 systemic scores 2017-2019 by school fee categories

	Average systemic score (standard deviations)
No-fee	-0.72
Low-fee	-1.20
Mid-fee	3.47

Given these features of the fee structures of schools in the different DBE quintiles, the analysis of early learning outcomes that follows is not presented by quintile, as is done for example in the Thrive by Five report (Giese *et al.*, 2022). Instead, we present results according to the fee structures of schools as in Table 2. The distribution of learners in the sample according to these categories, and by LOLT of the school, is shown in Table 3. The same information is shown graphically in Figure 3. The table shows that almost three-quarters (73.4%) of the total sample of learners are in no-fee schools, 17.4% are in low-fee schools, and the remaining 9.2% of learners are in mid-fee schools. While about 64% of Afrikaans schools are no-fee schools, this proportion is 92% among isiXhosa schools in the sample. It is important to note the very small number of learners in mid-fee schools – only 54 learners in Afrikaans LOLT schools (13.9% of the Afrikaans sample) and no learners in isiXhosa LOLT schools.

Table 3: Distribution of learners across school fee groups, by LOLT

	Afrikaans		isiXhosa		Total	
	N (learners)	% of Afrikaans sample	N (learners)	% of isiXhosa sample	N (learners)	% of total sample
No-fee	248	64%	183	92%	431	73%
Low-fee	86	22%	16	8%	102	17%
Mid-fee	54	14%	0	0.0%	54	9%

5.5.1. Education districts

It is important to note that the sample of schools is not distributed evenly across the five WCED districts that were selected for participation in the study. This can be seen in Table 4. There are particularly few schools from Metro Central (seven schools), and the largest number of schools are located in Metro East, which contains 36% of the total sample of schools (27 schools). The table also shows the number and proportion of schools with Afrikaans and isiXhosa as the LOLT, respectively. isiXhosa LOLT schools are overrepresented in Metro Central, Metro East, and Metro South, while Afrikaans LOLT schools are overrepresented in Cape Winelands.

Table 4: Learners and schools per education district

	Learners		Schools		Afrikaans		isiXhosa	
	N	Proportion	N	Proportion	N	Proportion	N	Proportion
Cape Winelands	117	20%	16	21%	16	100%	0	0%
Metro Central	56	10%	7	9%	5	71%	2	29%
Metro East	216	37%	27	36%	16	59%	11	41%
Metro North	127	21%	16	21%	12	75%	4	25%
Metro South	71	12%	9	12%	2	22%	7	78%

6.   Results

6.1.   What proportion of the sample are developmentally on track?

Figure 2 shows the total early learning scores of the Roots & Shoots sample, compared with the results of the national Thrive by Five results as well as the Thrive by Five results for the Western Cape. The figure shows that the Roots & Shoots sample performed very similarly to the Thrive by Five Western Cape sample, with 62% of children being developmentally on-track, 22% falling behind, and 17% falling far behind. The Roots & Shoots results also echo those of Thrive by Five in that the sample significantly outperformed the national sample of children enrolled in ECD centres.

**Figure 2: Learning totals, Thrive by Five vs. Roots & Shoots**
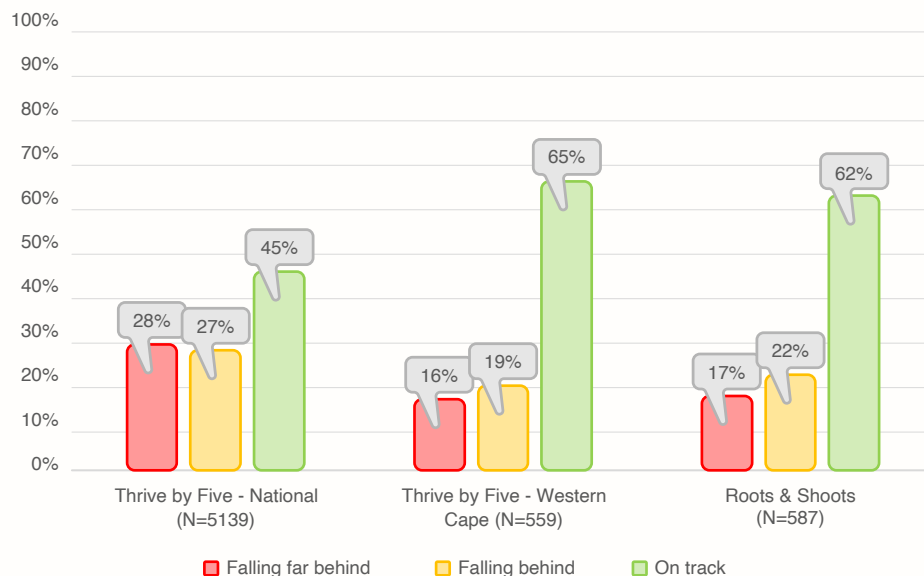
Figure 3 shows the total learning scores by sex (out of 100), and indicates that although girls slightly outperformed boys on the overall early learning measure, this difference was not statistically significant. Girls and boys therefore did not have significantly different overall learning scores.

**Figure 3: Total learning scores (means), by sex**
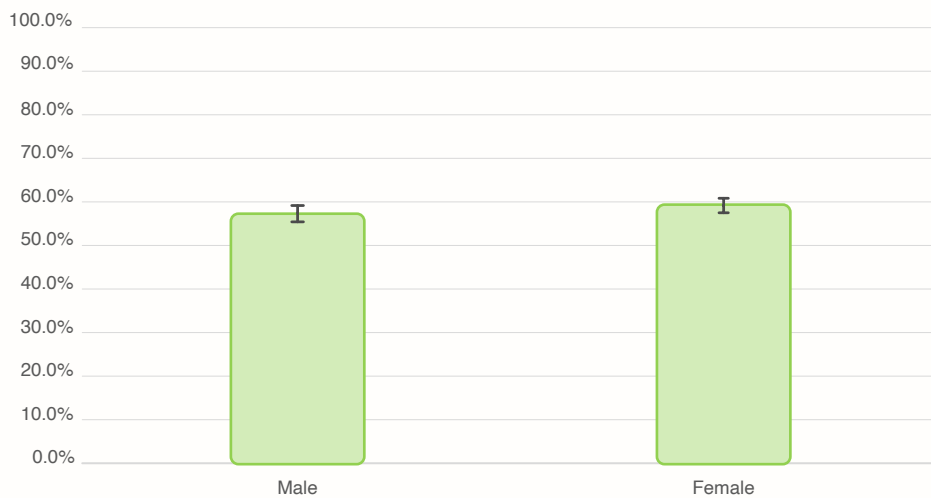
Note: Error bars indicate 95% confidence intervals.

Total learning scores by the school fee groups described in Section 5.5 are plotted in Figure 4. There is clear evidence of an SES gradient to total learning scores, with learners in mid-fee schools achieving significantly higher overall scores than learners in no-fee and low-fee schools. These differences are especially clear in Figure 5, which shows the proportions of learners on track, falling behind and falling far behind by school fee grouping: While just over half of learners in no-fee and low-fee schools were on-track in terms of overall learning scores, this proportion was 93% for learners in mid-fee schools. This constitutes strong evidence of an SES gradient to performance in the ELOM assessment.

Despite this clear SES gradient to performance in the ELOM, Figure 5 also shows that SES is not deterministically associated with early learning skills. That is, it is not the case, for example, that all learners attending no-fee and low fee schools performed poorly in the ELOM. In fact, there are arguably large proportions of learners in these schools who are developmentally on track. The finding that a large proportion of children in the Roots & Shoots sample attending low-fee and low fee schools are developmentally on track raises important questions about the trajectories of these learners. It will be interesting to see what happens to learners in no-fee and low fee schools who start school on track as they progress through the Foundation Phase. Do the learning outcomes of these learners converge to some low average, along with their classmates who start school developmentally behind? Or do these students remain on a higher learning trajectory, given their advantage in early learning skills when they start school? It will only be possible to answer such questions once the Roots & Shoots longitudinal data becomes available in 2023-2025.

Figure 4: Total learning scores (means), by school fee group
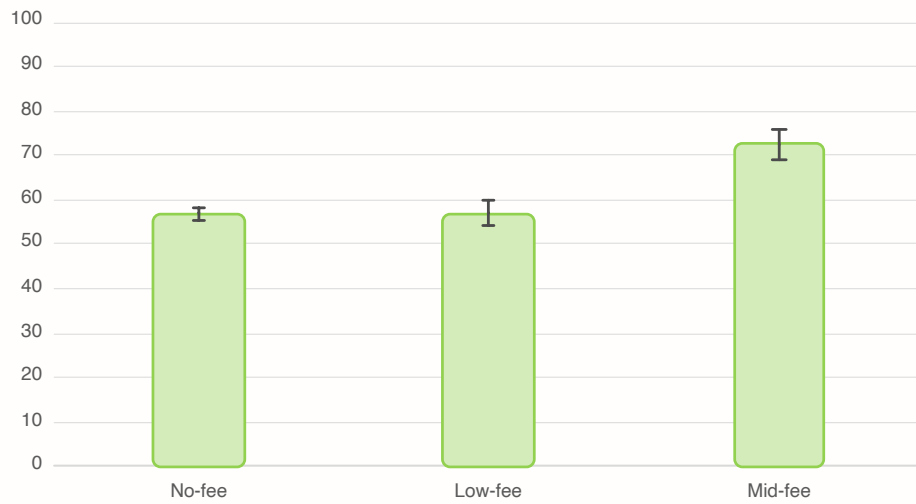
Notes: N (No-fee) = 431 learners; N (Low-fee) = 102 learners; N (Mid-fee) = 54 learners. Error bars indicate 95% confidence intervals.

Figure 5: Total learning scores: percent on track, falling behind and falling far behind, by school fee group
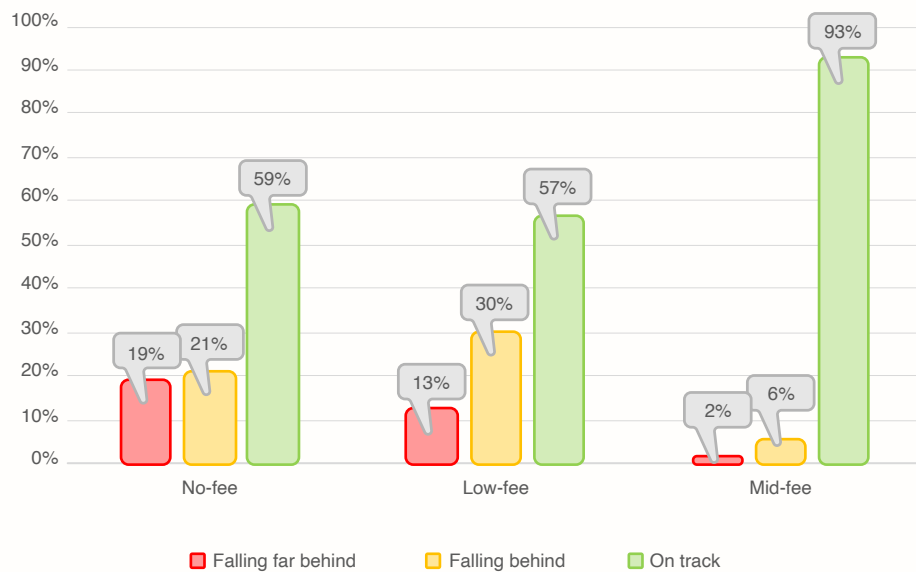
Notes: N (No-fee) = 431 learners; N (Low-fee) = 102 learners; N (Mid-fee) = 54 learners.

Figure 6 shows the proportions of learners on track, falling behind, and falling far behind on each of the early learning domains. Overall, learners performed worst on the fine motor coordination and visual motor integration domain, with only 49% learners being developmentally on track in this domain. Learners performed best on the emergent literacy and language domain, with 60% of the sample being on track in terms of this domain. These results echo the national Thrive by Five results, where children also performed worst in fine motor coordination and visual motor integration and best in emergent literacy and language (Giese et al., 2022). Detailed analysis of performance in each learning domain can be found in the Roots & Shoots Baseline Technical Report.

Figure 6: Percent on track, falling behind, and falling far behind in each learning domain
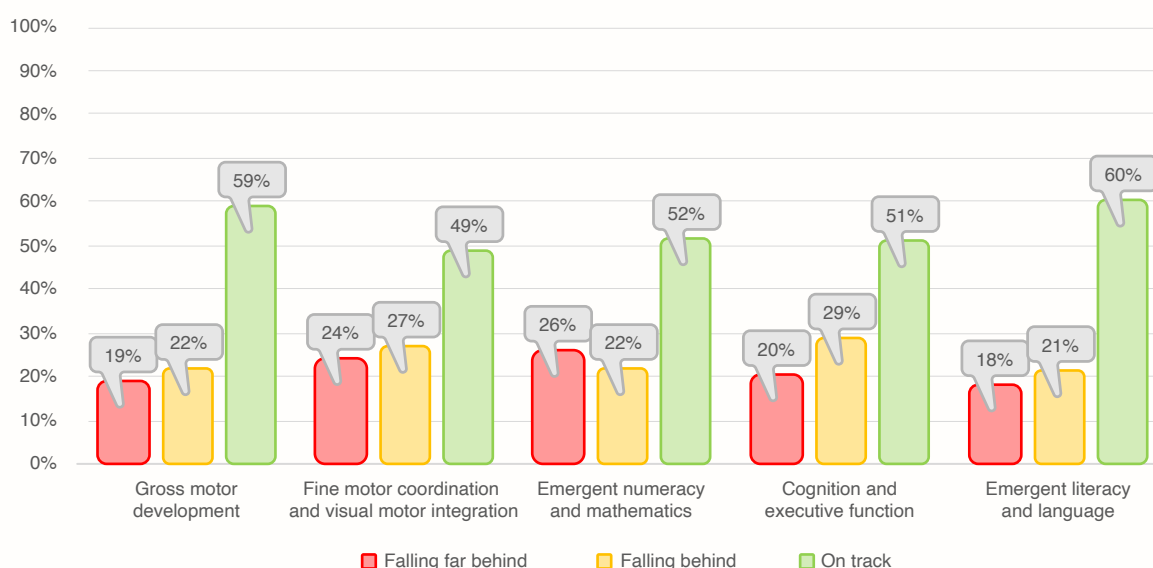
6.2.   What proportion of the sample are on track for physical growth?

An important physical indicator of child health is whether they have attained appropriate growth for their age. Height-for-age measures whether a child is at risk of stunting. Stunting is a long-term condition that reflects overall poor health status of the child and usually results from chronic malnutrition in utero and in early childhood[6]. Growth stunting is known to compromise neurological and cognitive development. The effects of early stunting depend on the child's age and duration of deprivation but can persist throughout childhood and adolescence, compromising the child's ability to learn in school and ultimately impacting on their life opportunities[7].

Overall, 35 children in the Roots & Shoots sample (6%) were found to be stunted[8]. The proportion of stunted children in the Roots & Shoots sample is much lower than the national proportion found by the Thrive by Five study (25%) as well as the provincial proportion reported by Thrive by Five (21%).

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6   Giese et al. (2022)
7   Giese et al. (2022)
8   The measurements for stunting are based on the World Health Organisation's (WHO's) 2007 Reference Group study, according to which a child is considered stunted if their height falls below two standard deviations of the mean of the WHO reference group.

Figure 7 shows the proportion of stunted children by sex, and indicates that although a slightly higher proportion of males were stunted, this difference is not statistically significant. Figure 8 shows the proportion of stunted children by school fee group, and points to differences in the proportion of stunted children by school fee group, with 7% and 6% of children in no-fee and low-fee schools being stunted respectively, and no children in mid-fee schools being stunted. The difference in the proportion of stunted children in no-fee and low-fee schools, on the one hand, and mid-fee schools, on the other, is statistically significant at the 95% level.

Figure 7: Proportion of the sample that is stunted, by sex
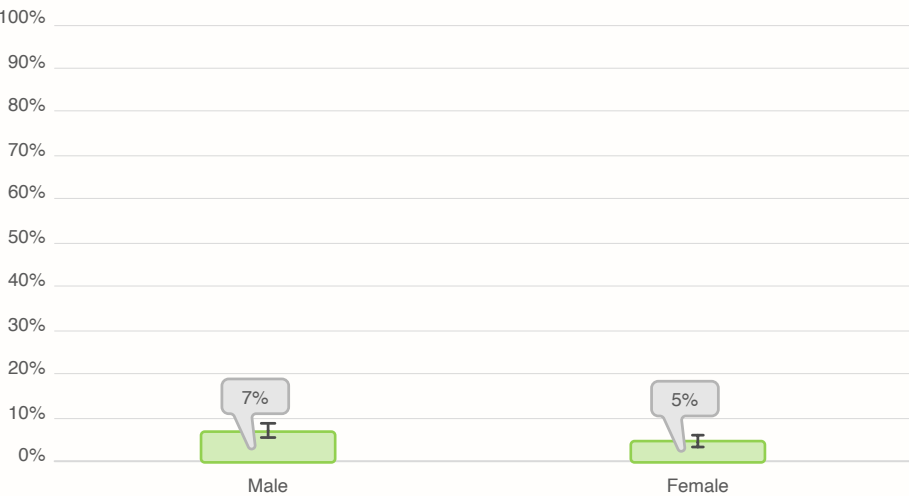
Notes: Error bars indicate 95% confidence intervals.

Figure 8: Proportion of the sample that is stunted, by school fee group

Notes: N (No-fee) = 431 learners; N (Low-fee) = 102 learners; N (Mid-fee) = 54 learners.

6.3. What proportion of the sample are on track for social-emotional functioning?

Socio-emotional functioning concerns a child's age-appropriate levels of independence, social relations with peers and adults, and emotional readiness for school[9]. Children with better social-emotional functioning tend to transition to the schooling environment more successfully, which is strongly related to their ability to learn, and, ultimately, academic achievement. Based on teachers' assessment of a child's self-care, social relations with peers and adults, and emotional readiness for school, learners were categorized as either meeting the standard for social emotional functioning or not meeting the standard.

Figure 9 shows the proportions of learners that met the standard on each of the subdomains of social-emotional functioning. Overall, learners were rated worst on emotional readiness for school, with 59% of Grade R learners being rated as not meeting the standard for this domain. Sex differences in social relations with peers and adults are shown in Figure 10. Girls were rated higher in this domain than boys[10], with 66% of girls meeting the standard for social relations with peers and adults. 57% of boys met the standard in this domain. Figure 11 shows sex differences in the emotional readiness for school domain of social-emotional functioning, and shows that girls were also rated higher in this domain than boys, with 66% of girls meeting the standard, compared with only 57% of boys[11]. Interestingly, there are no significant differences in the teacher-reported socio-emotional skills between learners in different fee groups, as is shown in Figure 12.

9   Giese et al. (2022)
10 This difference is statistically significant at the 10 percent level.
11 This difference is statistically significant at the 1 percent level.

Figure 9: Social-emotional functioning, percent meeting standard for different criteria

Figure 10: Social relations with peers and adults, percent children meeting the standard, by sex

Figure 11: Emotional readiness for school, percent children meeting the standard, by sex

Legend: ■ Do not meet standard ■ Meet standard

Male: Do not meet standard 43%, Meet standard 57%
Female: Do not meet standard 34%, Meet standard 66%

Figure 12: Social-emotional functioning, percent meeting the standard, by school fee group

No-fee 30%, Low-fee 37%, Mid-fee 41%

Notes: N (No-fee) = 431 learners; N (Low-fee) = 102 learners; N (Mid-fee) = 54 learners. Error bars indicate 95% confidence intervals.

6.4. Investigating variability in ELOM scores within schools

Figure 13 shows the proportion of learners within each surveyed class that was on track, falling behind and falling far behind. The cut-off points for the school fee groups are indicated on the graph. Each bar represents a Grade R class. The figure presents evidence of much variability in the proportion of learners on track, falling behind, and falling far behind (i.e. "at risk") within individual classrooms, across school fee groups. It is clear, however, that mid-fee schools have the least variability in ELOM scores, with the vast majority of Grade R learners in these seven schools being developmentally on track. Only one of these schools had Grade R learners who were falling far behind developmentally. By contrast, no-fee and low-fee schools had much more variability in ELOM scores within the same classrooms. One such school, for example, consists of a quarter of surveyed learners who are falling far behind, another quarter who are falling behind, and half who are developmentally on track. The challenges for Grade R teachers facing classes with such varying levels of skills upon school entry are immense, and deserves more research and policy attention.

The information presented in Figure 13 further points to much variation in the skills children enter school with, across schools charging different fees, and even within the same classes. That is, while SES clearly matters in terms of determining early learning skills, there is much variation within SES groupings in the skills children enter school with.

Figure 13: Percent on track, falling behind and falling far behind, by school
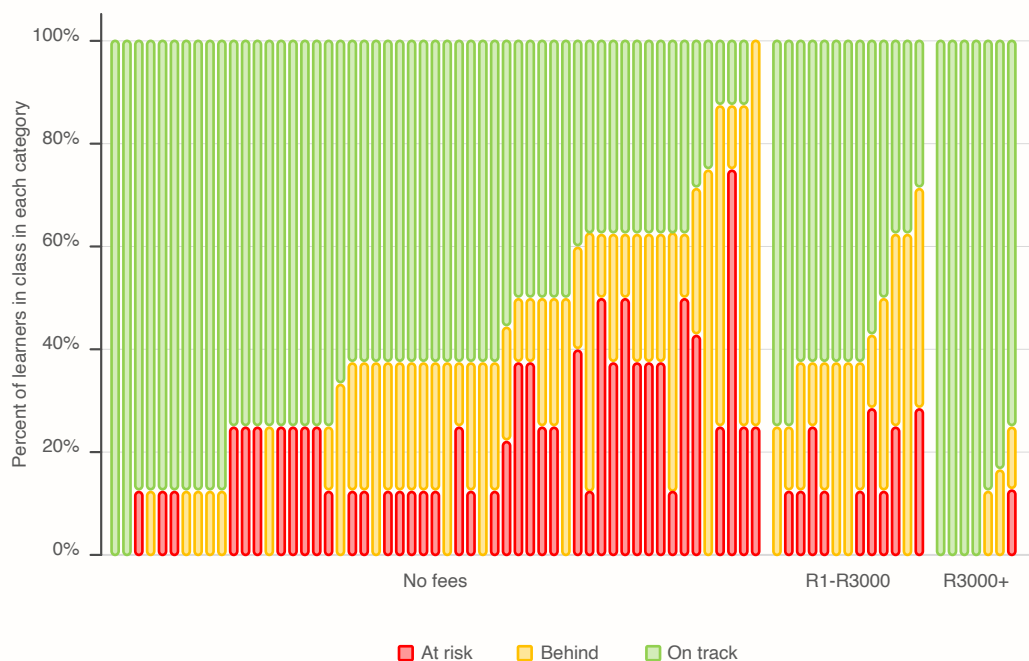
7. Comparing early learning scores with later school outcomes

The analysis presented thus far provides an indication of how Grade R learners in the Roots & Shoots sample performed on the ELOM assessment, with particular emphasis on gaps in early learning scores between males and females, as well as gaps across schools with different fee statuses. A major advantage of the Roots & Shoots sample of schools is that the Afrikaans schools in the sample are part of the Funda Wande early grade literacy and numeracy intervention, and, as such, learners in the same school were assessed in Grade 1 early literacy and mathematics as well as Grade 4 and 7 literacy. As a result, it is possible to compare learning gaps in Grade R with learning gaps in Grades 1, 4, and 7 in the same schools. It is important to note that the comparison of learning scores in the analysis that follows is not based on the same learners – the available data is cross-sectional, meaning it provides a snapshot of learner performance in one point in time, in four grades. It is also important to note that this school-level analysis of learning outcomes was only possible for the Afrikaans schools in the Roots & Shoots sample – i.e. no isiXhosa schools are included in the analysis that follows.

Figure 14 shows the mean school-level Grade R learning scores of the 50 Afrikaans schools in the sample, ranked from lowest-scoring to highest-scoring. Learning scores are expressed as z-scores[12]. Figure 15 shows the total Grade 1 learning scores of the same schools. If there were a perfect correlation between schools' Grade R scores and their Grade 1 scores, Figure 15 would look like Figure 14, that is, the Grade 1 z-scores would increase steadily from lowest to highest. The fact that the Grade 1 scores do not follow this pattern indicates that there is a relatively weak correlation between schools' Grade R learning scores and their Grade 1 learning scores. For example, the school with the lowest Grade 1 score ranked roughly 35th out of 50 in Grade R scores, with the 50th school being the best-performing school in terms of Grade R learning scores.

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12   Z-scores are calculated by transforming raw scores so that they have a sample mean of zero and a standard deviation of 1.

Figure 14: Mean school-level Grade R learning scores (z-scores), ranked from lowest to highest
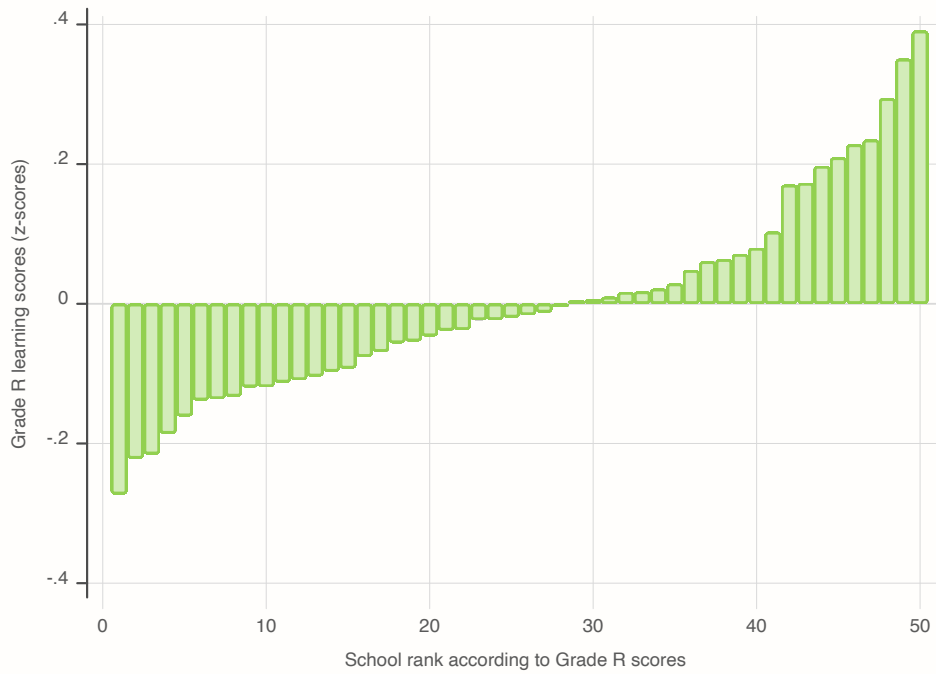

Figure 15: Mean school-level Grade 1 learning scores (z-scores), ranked from lowest to highest on schools' Grade R scores
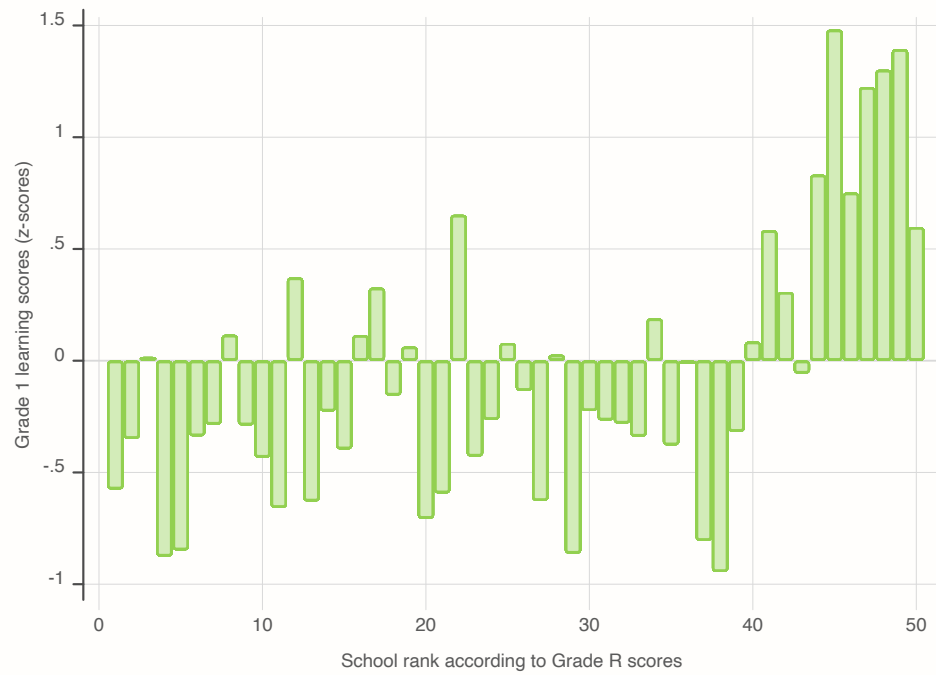
Figure 16 shows the same information, this time comparing Grade R learning scores with the Grade 4 learning scores of the same schools. This figure, too, is suggestive of a weak association between Grade R learning scores and Grade 4 learning scores of the same schools. Figure 17 compares the Grade R learning scores with the Grade 7 learning scores of the sample schools, and also points to a weak association between these scores.

Figure 16: Mean school-level Grade 4 learning scores (z-scores), ranked from lowest to highest on schools' Grade R scores
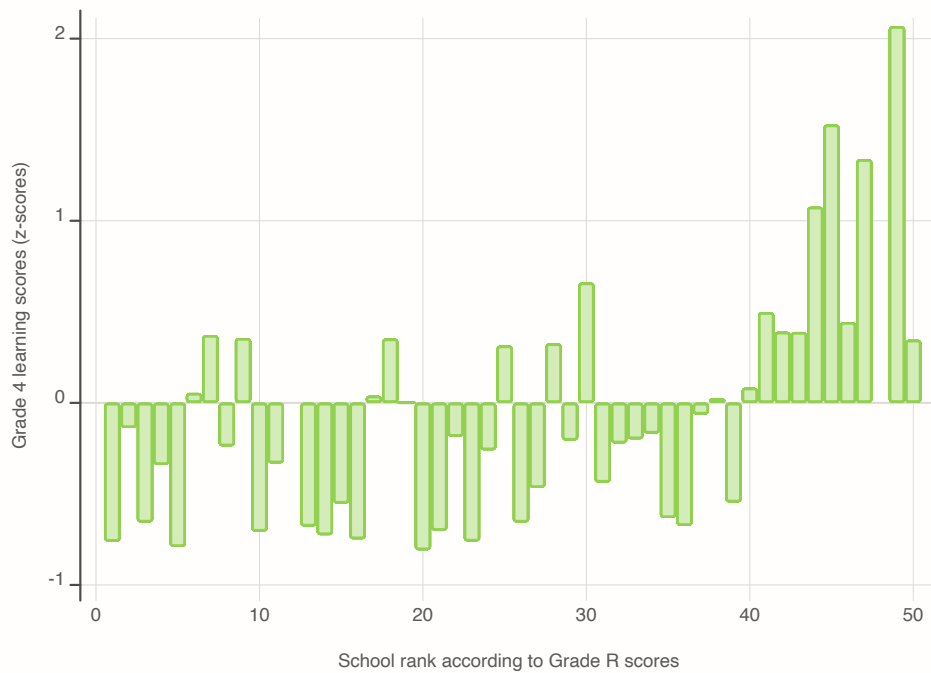

Figure 17: Mean school-level Grade 7 learning scores (z-scores), ranked from lowest to highest on schools' Grade R scores
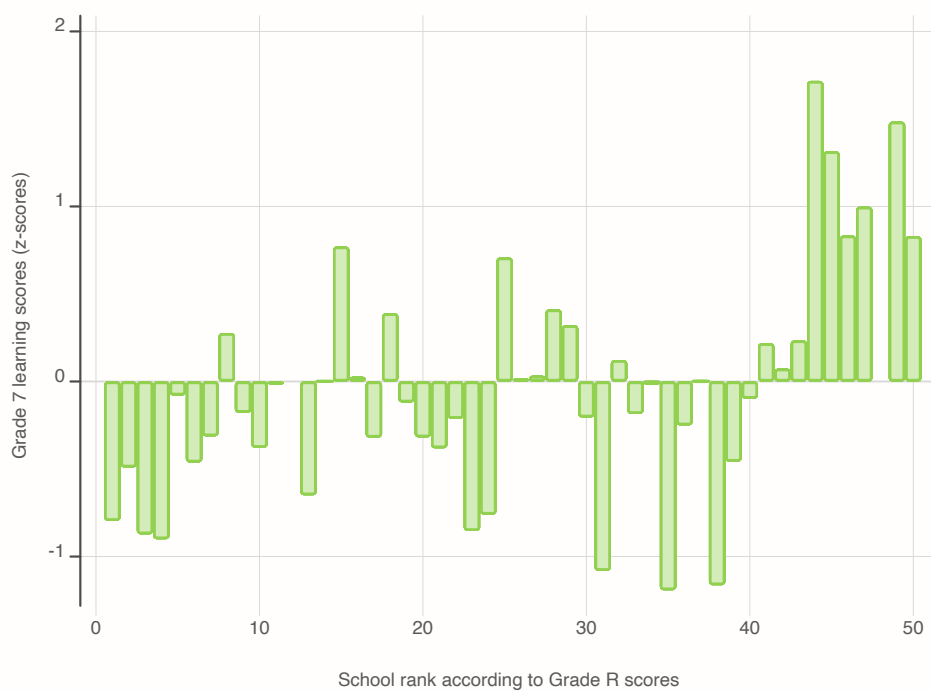
Table 5 presents results regarding the magnitudes of the associations between the 50 Afrikaans schools' mean Grade R ELOM scores and the total learning scores in later grades of the later grades. Coefficients are presented in standard deviations. If Grade R and Grade 1 learning scores were perfectly correlated, a one-standard-deviation increase in Grade R scores would be associated with a one-standard-deviation increase in Grade 1 scores. Instead, we see evidence of relatively weak associations between Grade R scores and learning scores in later grades, with, for example, a one-standard-deviation increase in Grade R scores being associated with a 16.1% standard deviation increase in Grade 1 learning scores. While the proportion of variation in learning scores in later grades explained by variation in Grade R scores may seem large, the magnitudes of these proportions mean that more than half of the variation in later learning scores are not explained by variation in ELOM scores. This is suggestive of important interaction effects between early skills and school quality, that is, it appears that both the skills that children enter school with and school quality matter in determining later learning outcomes.

Table 5: Associations between school-level mean Grade R total learning scores and scores in later grades

	Correlation (Standard deviations)	% of variation explained
Grade R & Grade 1 total learning scores	0.161	44.7%
Grade R & Grade 4 total learning scores	0.145	43.5%
Grade R & Grade 7 total learning scores	0.131	39.9%

Overall, the comparisons of school-level mean learning scores across grades suggest that home and school environments interact to produce learning outcomes. That is, while there are clear SES differences in early learning skills, it appears that schools also play a large role in determining children's literacy achievement – schools do not simply reproduce the patterns of performance that are observed when children first enter school. This evidence is merely suggestive, however, since the literacy scores compared above are not scores of the same children. Only once longitudinal data is available on the same children – as will be collected through the Roots & Shoots project – will it be possible to ascertain with more certainty to what extent patterns of performance observed at the start of formal schooling are maintained as children progress through the primary school grades.

8. Summary of main results

Many children in the Roots & Shoots sample start formal schooling with a backlog in early skills, with 38% of sampled Grade R learners not meeting the standard for being developmentally on-track. As is reported in the Thrive by Five Report, this proportion is much higher for the nationally representative sample of five-year-olds assessed in the Thrive by Five study (55%). The evidence therefore echoes the findings of the Thrive by Five Report, namely that many children start school without the skills needed to learn effectively.

There are clear SES differences in ELOM scores. Specifically, the results vpresented here show that learners attending schools that charge higher fees far outperformed learners in no-fee and low-fee schools in the ELOM assessment. This is strongly suggestive that the large achievement gap between poor and less poor children in South Africa can partly be explained by the fact that poorer children, on average, start school less prepared for the demands of adjusting to the formal schooling environment than do their wealthier counterparts. In essence, the results presented here suggest that the same phenomenon observed in many countries around the world, namely of "inequality at the starting gate", is part of the reason for South Africa's highly unequal education outcomes in later grades.

There is much variability in the skills children start school with, even within the same classrooms. This poses immense challenges for teachers, since it is not clear at what level they should pitch their lessons. In addition, this result raises important questions about the trajectories of learners in the same school who start school with varying levels of skills. Only once the Roots & Shoots longitudinal data is available will it be possible to determine what happens to the learning trajectories of learners in the same schools who start school developmentally on track, falling behind, or falling far behind where they should be.

Both the home and school matter in determining learning outcomes. The comparison of school-level mean learning scores across grades shows that while there is only a relatively weak association between the skills children enter school with and their later learning outcomes, variation in Grade R scores explain around 40% of variation in learning scores in later grades. Considered with the results of SES differences in Grade R scores, this suggests that both home and school environments play important roles in shaping children's learning outcomes. This result is based on performance data of different learners, however, and so remains merely suggestive. Once again, it will be possible to determine with more certainty to what extent school quality determines learning outcomes in the later grades once the longitudinal Roots & Shoots data becomes available.

9. Conclusion

The Roots & Shoots study presents a unique opportunity to investigate how the skills that children enter school with are translated into learning outcomes as they progress through school. While efforts are being made to construct longitudinal achievement data in South Africa[13], Roots & Shoots is the first study that will have information about children's skills when they first started school. Given the strong overlap between children's SES and the quality of the schools they attend in South Africa[14], it is currently very difficult to disentangle the effects of growing up in poverty from those of attending low-quality schools in the country. The longitudinal Roots & Shoots data will provide the first opportunity to do so in South Africa. This will inform our understanding of how developmental gaps at the start of formal schooling are translated into academic performance in later years, thus improving our understanding of the sources of South Africa's poor educational outcomes.

The results in this report add new evidence to our understanding of the relationship between the skills children start school with and their later learning outcomes. The results from the first round of data collection in the Roots & Shoots study show that, indeed, many learners start school without the skills that are required for them to learn effectively. There are, however, also many learners in no-fee and low-fee schools who do start school on track developmentally. Investigating what happens to the learning outcomes of these learners as they progress through school is crucial for informing our understanding of how the skills that children enter school with are translated into later learning outcomes.

13 Such as, for example, the Early Grade Reading Study (EGRS).
14 Spaull (2013)

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