ELOM 4&5 and ELOM-R predict performance on **Early Grade Reading and Mathematics Assessments in Grade 2**

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1. Introduction

Acquired numeracy and literacy skills prior to school entry are strongly linked to academic achievement later in life (Duncan et al., 2007; Visser et al., 2019).

Research indicates that children with stronger school-entry skills have better reading and maths outcomes in the early grades, as subsequent development builds on these initial capabilities (Burchinal et al., 2020; Duncan et al., 2007; Visser et al., 2019). Foundational domains for mathematics learning include the ability to discriminate between quantities represented by numerals, identify number patterns, perform operations such as addition and subtraction, and apply these skills in real-life settings. Several emergent language and literacy skills developed in early childhood also influence later reading achievement, such as having a large vocabulary, being able to identify a few letters before age five, and understanding stories (Dawes & Biersteker, 2025).

Social-emotional functioning (SEF) is another important dimension of school readiness, as it equips children to adjust to formal schooling, which is strongly related to their ability to engage with others and learn effectively (Burchinal et al., 2020). A large longitudinal study found that SEF at age four predicted academic performance in Grade 5 (Ricciardi et al., 2021). However, early cognitive skills are relatively stronger predictors of achievement. Within the cognitive domain, early mathematics skills, such as counting, number knowledge, estimation and measurement, are the most powerful predictors of later academic achievement (Duncan et al., 2007).

There is only one large South African study, published in 1994, that reports predictors of mathematics and reading achievement during the Foundation Phase (Robinson & Hanekom, 1994). In South Africa, where educational disparities remain a major challenge, it is essential to have reliable tools that can assess children's skills at school entry and predict their later learning outcomes. This knowledge is key to informing policies and designing interventions to bridge academic achievement gaps and ensure all children receive the support they need to succeed from the outset.

2. Background

The Roots and Shoots longitudinal study, which is being conducted in the Western Cape, aims to determine how differences in school readiness at the start of formal schooling link to differences in learning outcomes in the early grades. Data has been collected at three different timepoints to track learner performance from the start of Grade R through the Foundation Phase grades. In this study, children were assessed using the ELOM 4&5 in Grade R (average age 65.4 months), and in early Grade 1 (average age 76.92 months), mathematics and language skills were measured using the recently developed ELOM-R. The Early Grade Reading Assessment (EGRA; Dubeck & Grove, 2015) and Early Grade Mathematics Assessment (EGMA; Platas et al., 2014) were used to assess reading and maths performance at the end of Grade 2 (average age 94.56 months). This has permitted an investigation into the predictive validity of the ELOM 4&5 and the ELOM-R Language and Mathematics assessments.

Predictive validity (a form of Criterion validity) measures how well an assessment can predict future performance on a criterion measure. Establishing the predictive validity of tools designed to assess children's early learning progress and school readiness is important because it means that we can reliably identify children likely to have poor future performance in reading and mathematics and in need of additional academic support in Early Learning Programmes and in Grades R and 1. Targeted and early interventions for at-risk learners has the potential to promote more equitable educational outcomes in South Africa.

> **i** **The primary aim of this insights brief is to investigate (1) whether the ELOM 4&5 assessment, administered at the start of Grade R, predicts performance on the ELOM-R Language and Mathematics assessments in Grade 1, and (2), whether performance on the ELOM-R assessments predicts reading and maths performance in Grade 2 (assessed by the EGRA and EGMA respectively).**

We note that this study does not have measures of teaching quality and other school and home environment variables (apart from socio-economic status) that are likely to influence school achievement in these areas.

3. Method

Prior to data collection, ethical clearance for the Roots and Shoots study was obtained from the University of Cape Town's Commerce Faculty, and permission to conduct research in schools was granted by the Western Cape Education Department's Directorate of Research (Hofmeyr et al., 2022). Assessors were all ELOM-accredited assessors and assessments were conducted in a quiet space at the schools. Every child was assessed in their home language (Hofmeyr et al., 2022).

3.1. Describing the sample

Roots and Shoots provided data from 585 Grade R children from 75 schools in the Western Cape. The sample was randomly selected from 50 Afrikaans-medium schools and 25 isiXhosa-medium schools. Notably, 73% of the sample attended no-fee schools and 16% attended low-fee schools (R1,000 – R3,000 per annum), indicating that 90% of the sample came from disadvantaged, low-income households (Hofmeyr & Qvist, 2025). This analysis was based on 378 children with complete data on all variables used in the path model. The final sample was 48% male (n = 183) and 52% female (n = 195).

4. Measures

Demographic data, such as child age and gender, was obtained. Socio-economic status (SES) was measured using 13 binary household asset variables (radio, mobile, television, computer, fridge, bicycle, vehicle, washing machine, microwave, toilet, electricity, running water and hot water). Principal component analysis (PCA) was used to create an SES index which captures the main pattern of household asset ownership.

4.1. The ELOM Social and Emotional Functioning Scale

Socio-emotional skills were measured at the start of Grade R using the ELOM Social and Emotional Functioning (SEF) Rating Scale. The SEF Rating Scale, a short assessment used together with the ELOM 4&5, was administered to the child's teacher to assess two key areas:

- Social relations with peers and adults (6 items)
- Emotional readiness for school (6 items)

Responses to the 12 items were combined by aggregating item scores within each scale and calculating a weighted average of the two subscales to create a single variable reflecting socio-emotional functioning.

4.2. The ELOM 4&5

The ELOM 4&5 was administered to each child at the commencement of Grade R. The ELOM 4&5 is an age-normed assessment tool for use with children between 50 and 69 months. It involves a direct assessment of children's performance in five developmental domains:

- Gross Motor Development (GMD)
- Fine Motor Coordination and Visual Motor Integration (FMC-VMI)
- Emergent Numeracy and Mathematics (ENM)
- Cognition and Executive Functioning (CEF)
- Emergent Literacy and Language (ELL).

4.3. The ELOM-R

The ELOM-R (v1) tools[1] (Dawes & Biersteker, 2025; Kleineibst et al., 2025a; 2025b) assess language and mathematics skills central to children's readiness when they enter Grade 1. The tools are standardised tests that fairly assess children in any of South Africa's 11 official languages.

The ELOM-R Language (v1) Assessment Tool measures emergent literacy and language skills and contains eight items under the following themes: Listening and speaking, reading and phonics, and writing and handwriting.

The ELOM-R Mathematics (v1) Assessment Tool measures emergent mathematics skills. This assessment contains 18 test questions under the following themes: Number sense and operations, shape and space, patterns, functions, algebra, and measurement.

Overall scores are calculated by aggregating the average percentage correct score for each item per assessment. The skills measured in both ELOM-R tools are aligned with the Curriculum Assessment Policy Statements (CAPS) for Grade R.
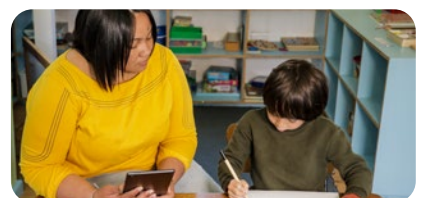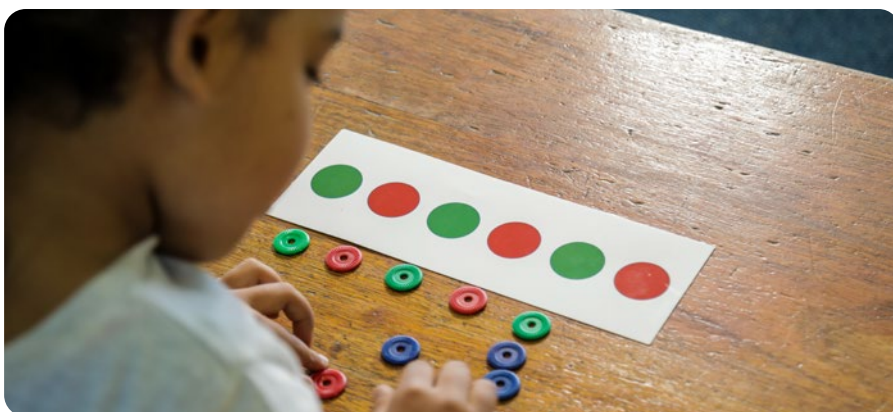
Implementation of the ELOM-R assessment tools.

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[1] *All references in this document to the ELOM-R measures imply the ELOM-R (v1) version of the tools.*

4.4. The EGMA and EGRA

The Early Grade Reading Assessment (EGRA; Dubeck & Grove, 2015) and the Early Grade Mathematics Assessment (EGMA; Platas et al., 2014) was administered when the children were in Grade 2.
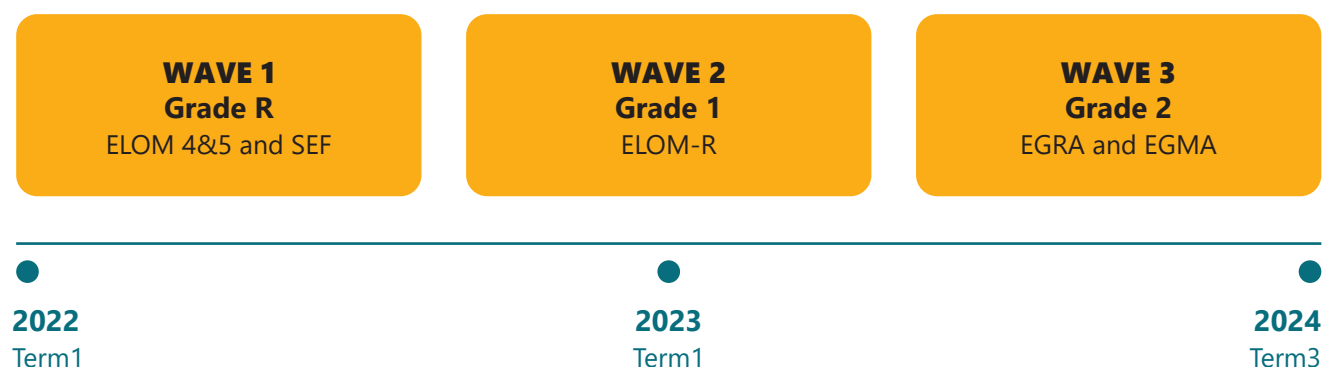
The EGRA, adapted for use in Afrikaans (Ardington et al., 2022) and isiXhosa (Ardington et al., 2020), tested learners literacy skills including letter-sound recognition, complex consonants and diacritics, phonemic awareness, familiar word reading, oral reading fluency, reading comprehension and listening comprehension (Hofmeyr & Qvist, 2025).

The EGMA was used to assess mathematics skills and consisted of several tasks that tested number recognition, number comparison, single-digit addition, single-digit subtraction, double-digit addition and subtraction, number patterns and word sums.

For both the EGRA and the EGMA, learners' scores on each of the seven tasks were standardised and then averaged to create an overall composite score for each instrument.

A timeline depicting the longitudinal tracking of learners across three timepoints is shown in the figure below.

Figure 1. Three waves of data collection for the Roots & Shoots study.

| WAVE 1 Grade R ELOM 4&5 and SEF | WAVE 2 Grade 1 ELOM-R | WAVE 3 Grade 2 EGRA and EGMA |

**2022** Term1   **2023** Term1   **2024** Term3

5. Statistical Analyses

To investigate whether the ELOM 4&5 and ELOM-R assessments can predict later reading and maths skills, we conducted path analysis, a statistical method that tests how variables influence each other over time (Kline, 2015). All scores were standardised to have a mean of 0 and a standard deviation of 1 for comparability.

The path model tested the following relationships:

- Does SES, gender, and socio-emotional functioning predict ELOM 4&5 performance at the start of Grade R?
- Does ELOM 4&5 performance in Grade R predict ELOM-R Language and Mathematics performance in Grade 1?
- Does ELOM-R Language and Mathematics performance in Grade 1 predict EGRA and EGMA performance in Grade 2?

Figure 2. Theoretical model tested in path analysis.
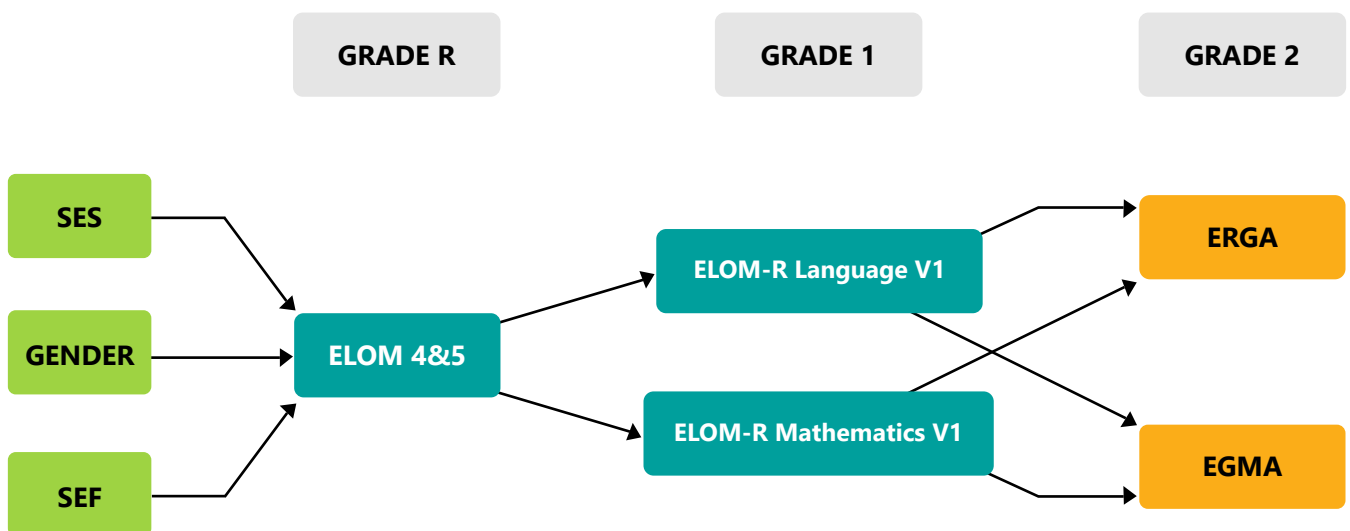
Note: Path analysis tests a theoretical model constructed on the basis of developmental theory and prior empirical evidence.

6. Key Findings

6.1. Relationship between SES and Gender, and ELOM 4&5 at the start of Grade R

SES was a significant, positive predictor of ELOM 4&5 performance in Grade R (β = 0.095, p = .047). **In other words, children who had more household assets performed better in Grade R in the current sample.** Note that this relationship (while statistically significant given the sample size), is not strong. This is likely because as noted above, 90% of the sample came from disadvantaged, low-income households and there is thus very little variation in SES scores. Had children from higher SES been included, the effect of SES would likely have been greater.

Surprisingly given other findings (e.g. Tredoux et al., 2024), gender did not significantly influence ELOM 4&5 performance.

6.2. Relationship between Socio-Emotional Functioning and ELOM 4&5 at the start of Grade R

Socio-emotional functioning predicted ELOM 4&5 performance, with stronger socio-emotional skills linked to higher ELOM 4&5 total scores (β = 0.370, p = .000). **In other words, social and emotional skills have a direct and positive influence on children's development when assessed at the start of Grade R.**

6.3. Relationship between ELOM 4&5 and ELOM-R Language and Mathematics at the commencement of Grade 1

ELOM 4&5 performance in Grade R was a strong, positive predictor of ELOM-R Language (β = 0.571, p = .000) and Mathematics (β = 0.592, p = .000) performance at the commencement of Grade 1. These relationships explained 32.6% and 35.1% of the variance in ELOM-R Language and Mathematics scores respectively. **Put differently, children with better early learning outcomes at the start of Grade R show stronger language and maths abilities at the start of Grade 1. This finding supports the predictive validity of the ELOM 4&5.**

6.4. Relationship between ELOM-R Language and Mathematics and EGRA and EGMA at the end of Grade 2

ELOM-R Language performance was a strong, positive predictor of EGRA (reading) performance in Grade 2 (β = 0.557, p = .000). ELOM-R Language performance was also a positive predictor of EGMA (maths) performance but had a smaller effect (β = 0.213, p = .000).

ELOM-R Mathematics performance was a positive predictor of EGRA (β = 0.192, p = .001) and EGMA (β = 0.423, p = .000) performance in Grade 2. Taken together, these findings support the predictive validity of both ELOM-R tools.

> **i** **Children who scored higher on the ELOM-R assessments tended to do better in reading and maths by Grade 2, showing that these early assessments can help predict later learning success.**

While the results presented here show the relationship between ELOM-R and Grade 2 EGMA and EGRA results, additional analyses conducted for the 4th edition of the ELOM 4&5 Technical Manual found that scores on ELOM 4&5 also significantly predicted scores in Grade 2 on EGMA (β = 0.320) and EGRA (β = 0.431).

Figure 3 presents the standardised path coefficients. Gender and covariances (relationships between variables changing together) are excluded for clarity.

Figure 3. Path Model Output.

Wave 1: Grade R (2022)

Wave 2: Grade 1 (2023)

Wave 3: Grade 2 (2024)
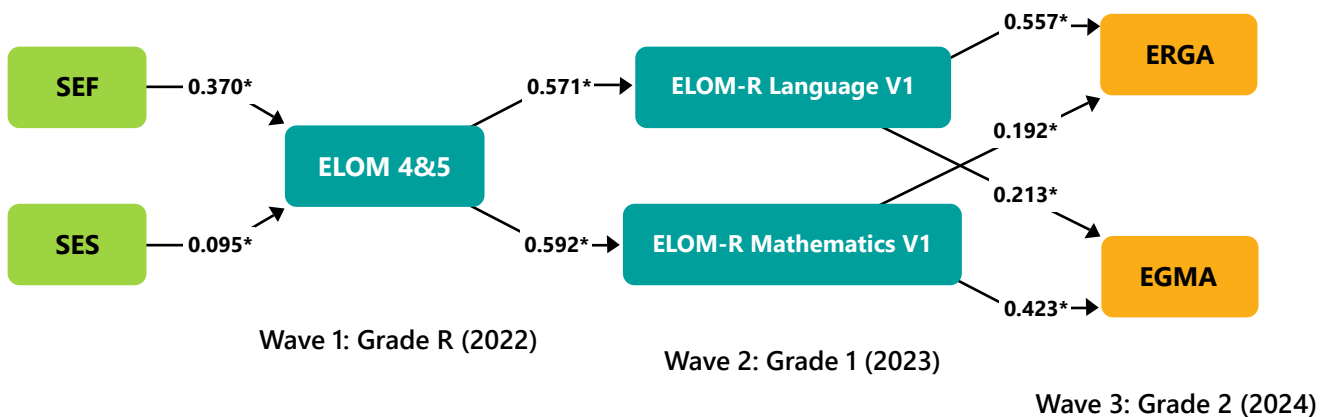
Note. SEF = socio-emotional functioning; SES = socio-economic status; EGRA = Early Grade Reading Assessment; EGMA = Early Grade Mathematics Assessment.

Standardised coefficients measure the relative strength and direction (sign) of the relationship between variables in the path model. Standardised coefficients show how many standard deviations the dependent variable (the outcome that is predicted at each point along the path) is expected to change when the independent variables (the predictors) change by one standard deviation. A coefficient close to +1 indicates a strong positive relationship, meaning as one variable increases, the other also increases. A coefficient close to -1 indicates a strong negative relationship meaning as one variable increases, the other decreases.
* p < .05.

7. Discussion and Conclusion

Learning is a cumulative process and children who struggle in the early grades often face persistent academic challenges which widens the achievement gap and perpetuates socioeconomic disadvantage.

Globally, children are expected to be able to read for meaning in at least one language by the end of Grade 3 (Spaull & Pretorius, 2019). However, the Progress in International Reading Literacy Study (PIRLS) found that 78% of South African Grade 4 learners cannot read for meaning in any of the country's 11 official languages. These poor literacy outcomes can be traced back to the early years (Hofmeyr et al., 2022). Research has consistently shown that children's early skills are important predictors of later outcomes (Duncan et al., 2007; Spaull & Kotze, 2015; Spaull et al., 2016; Visser et al., 2019). This is consistent with the findings presented here and underscores the value of having assessment tools that can identify children at risk of falling behind early on.

> **i**
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> **The findings show that both the ELOM 4&5 and ELOM-R assessments were significantly and positively associated with reading and maths performance a school year later.**

Consequently, these assessments can reliably detect children who are less likely to do well in the first two years of formal schooling in South Africa. Given the strong relationship between school-entry skills and later academic achievement, these findings highlight the importance of using validated assessment tools like the ELOM 4&5 and ELOM-R to monitor progress and identify groups of children who may need additional support before Grade 1 (Spaull & Pretorius, 2019). This calls for not only targeted interventions like coaching or teaching assistants but also broader reforms addressing teacher training, accountability, and resource allocation (Spaull & Taylor, 2022).

An important limitation of this study is that the SES index, based solely on asset ownership, may not fully capture other dimensions of SES such as household income, caregiver education, and employment. Most prior research finds SES to be a strong moderator of mathematics and language skill acquisition (Raghubar & Barnes, 2017; Visser et al., 2019). However, in the path model, SES had a relatively small effect on ELOM 4&5 total scores, potentially due to the sample's homogeneity limiting the SES index's ability to detect socioeconomic variation.

For more information on the ELOM assessments, visit the DataDrive2030 website: **datadrive2030.co.za**

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