



Do South African
Early Childhood Development programmes
improve cognitive outcomes?
Preliminary evidence

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The Heckman heuristic

James Heckman, 2000 Nobel prize laureate for Economics, is best known outside Economics for his work on the importance of early investment in children.

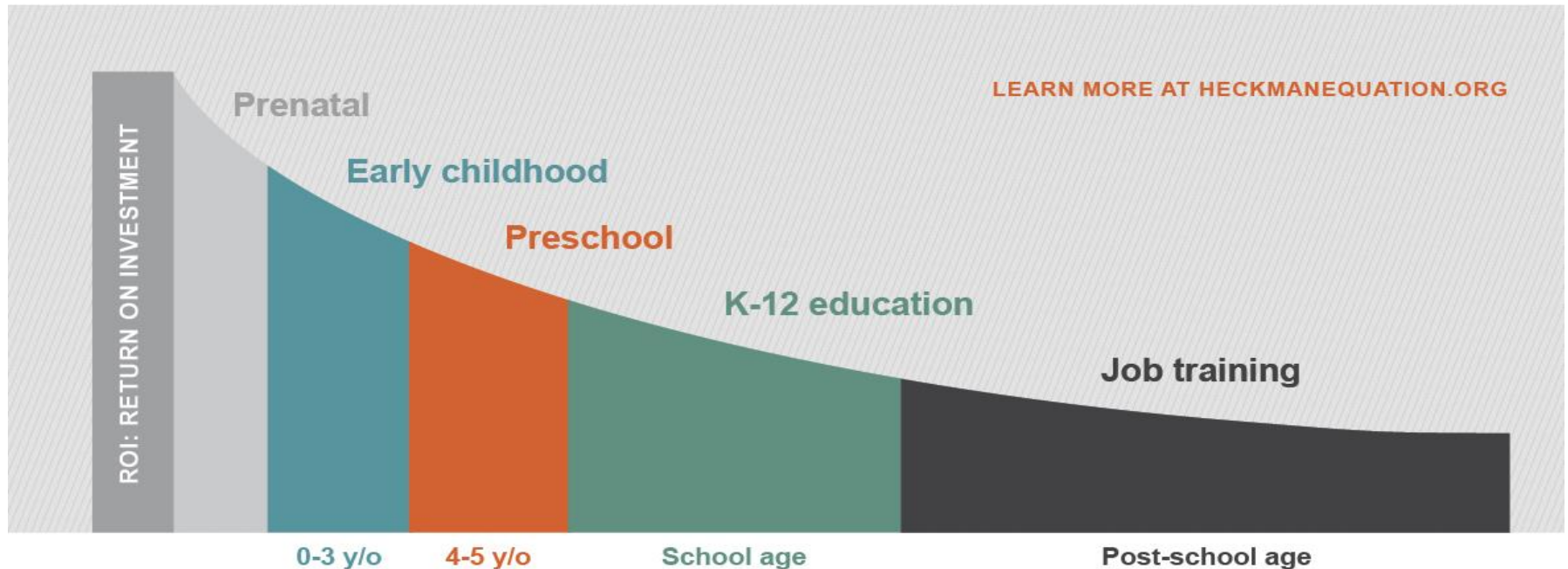
‘Heckman equation’ is universally used to make the generic case for ECD:

‘The Heckman Curve shows that the highest rate of economic returns comes from the earliest investments in children ... society invests too much money in later development when it is often too late to provide great value’



Return on Investment

Economic impact of investing in early childhood learning.



Research questions: Interrogating the Heckman view

Does the 'Heckman equation' hold in SA?

- ELPO study of 5 better-performing poor ELPs showed gain scores considerably exceeding normal gains from maturation (Van der Berg, 2021) ✓
- But regressions on Thrive by Five data show that previously enrolled children performed a little better than those not enrolled before, with gains concentrated in Quintile 5 ELPs (Van der Berg, 2023) ✗

If not, why not?

- Poorly performing ELPs generally show a deficit in **process quality**, especially **weak teaching strategies** (Kika-Mistry, n.d.)

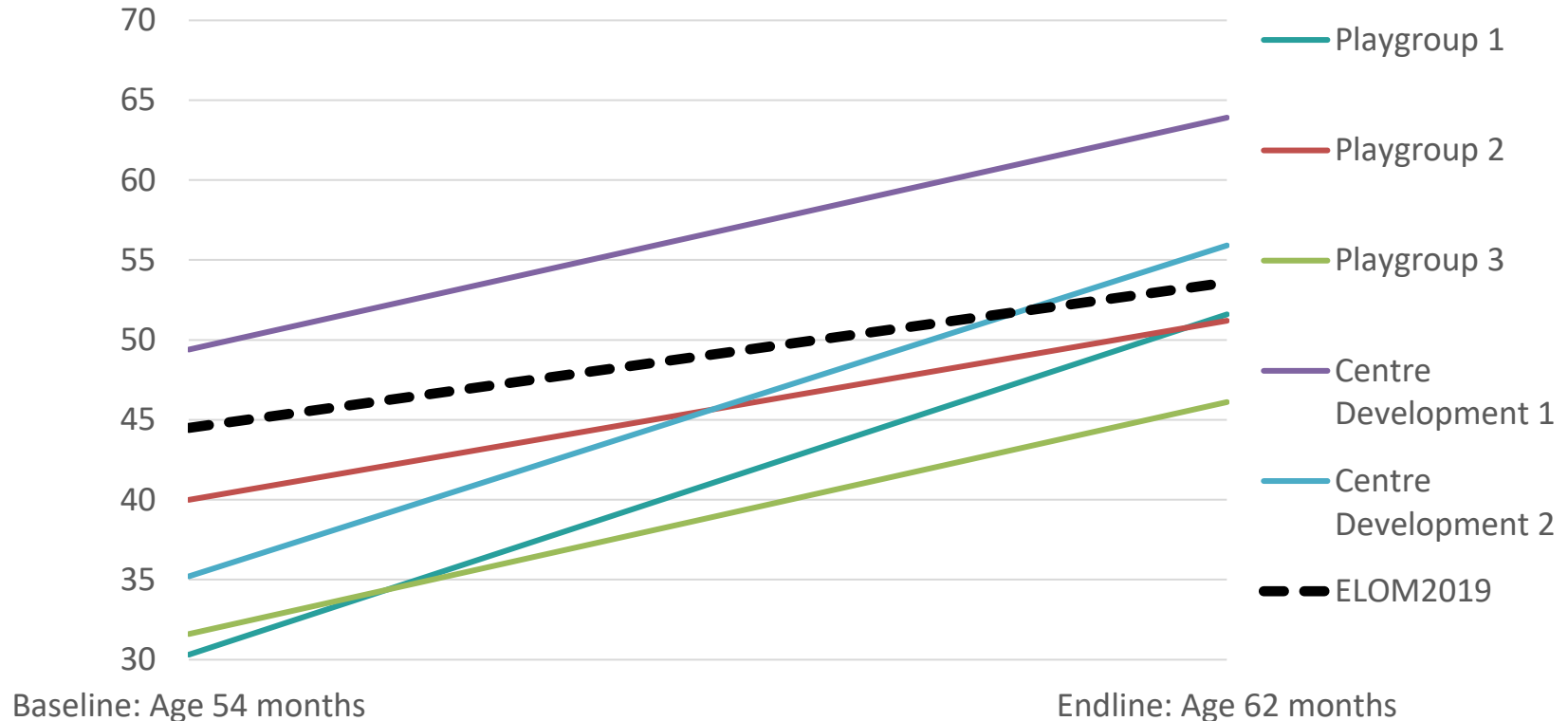
How can ELPs improve cognitive outcomes?

- Process quality, in particular **teaching strategies**, is **better if practitioners have had more training/education**, even in poorer ELPs (Kika-Mistry, n.d.)

**DO ECD PROGRAMMES IMPROVE COGNITIVE
OUTCOMES FOR THE POOR?**

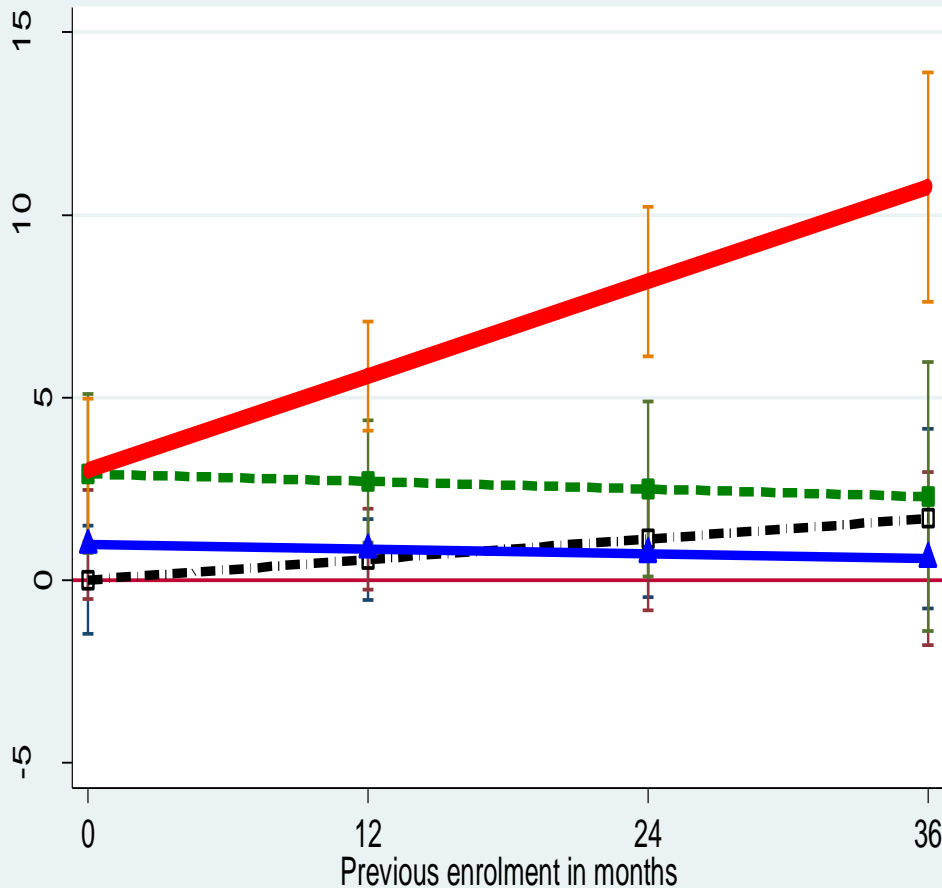
Large cognitive gains in 5 ECD programmes

Van der Berg (2021) compared gains in cognitive outcomes from five ELPs to normal gains from maturation of 1.0 to 1.2 ELOM points per month. These programmes showed **substantial gains**.



But Dawes (2020: 9) pointed out that *these ECD playgroups and centres have been “rated as well-functioning by their parent organisations. The same programmes, if poorly delivered, could not be expected to show the same outcomes...”*

Previous enrolment shows cognitive gains only for Quintile 5 ELPs



Female	3.054***
Age (months)	1.142***
Quintile (Ref: Quintile 1)	
Quintile 2	-0.067
Quintile 3	1.783**
Quintile 4	6.466***
Quintile 5	6.713***
Previous enrolment (months)	0.014
Quin2*Previous enrolmentt	0.073
Quin3*Previous enrolment	-0.009
Quin4*Previous enrolmen	-0.069
Quin5*Previous enrolment	0.186***
Constant	-21.047***
N	3 719
R-squared	0.122

Limitations of this regression analysis

- Data not designed for this purpose
- Measurement only applies to those participating in 'Grade RR' (children aged 4-5 years), and only to period before 'Grade RR'
- Length of previous enrolment does not consider the 'dosage', especially during Covid

Note also that **cognitive gains are not the only benefit of ECD**

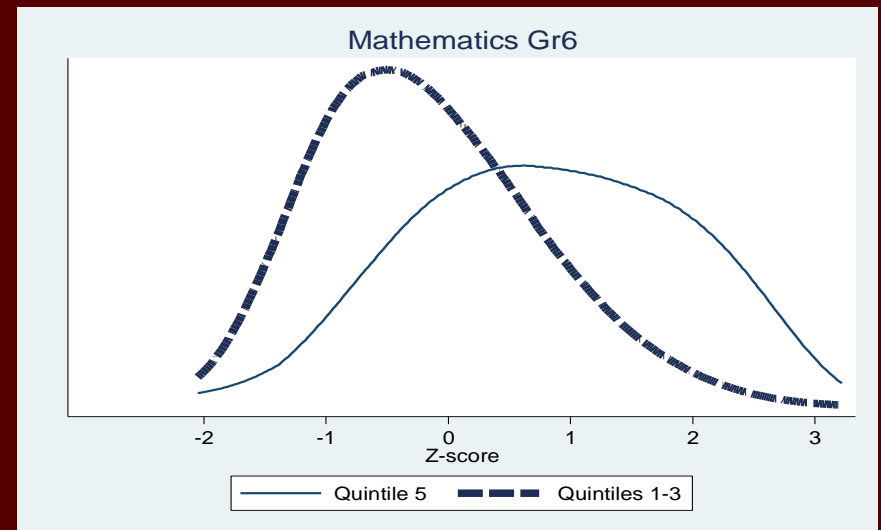
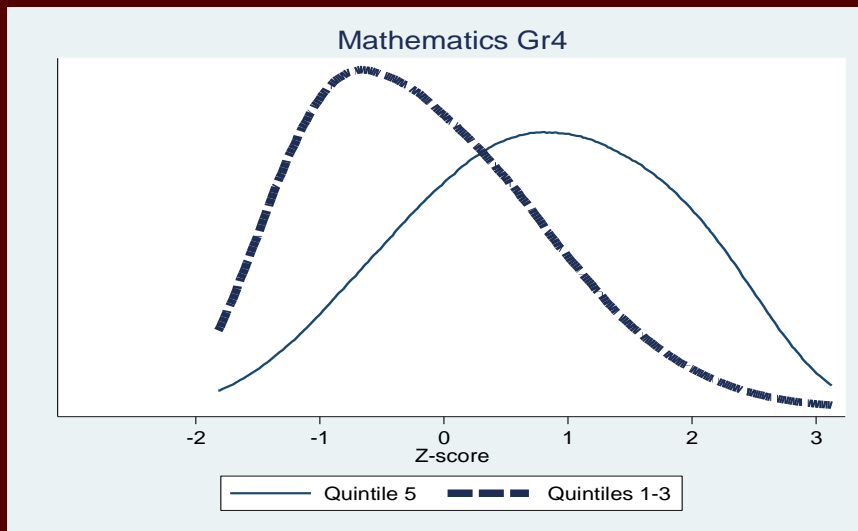
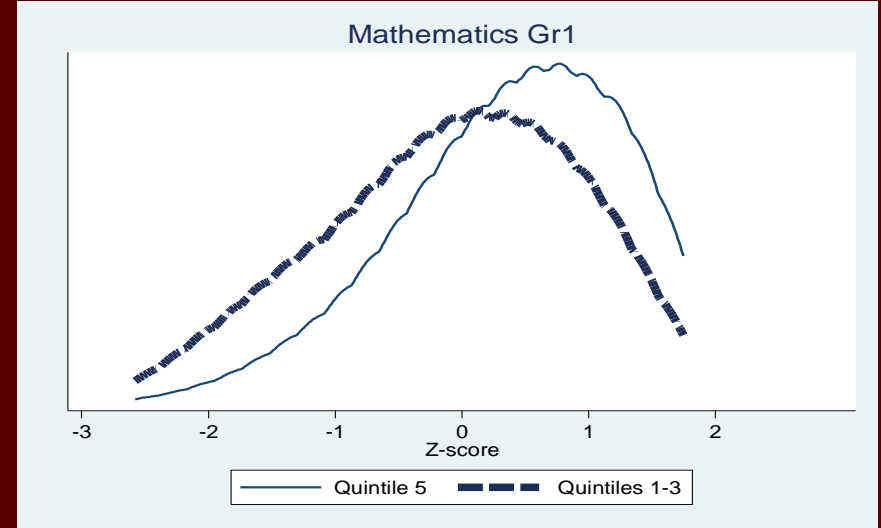
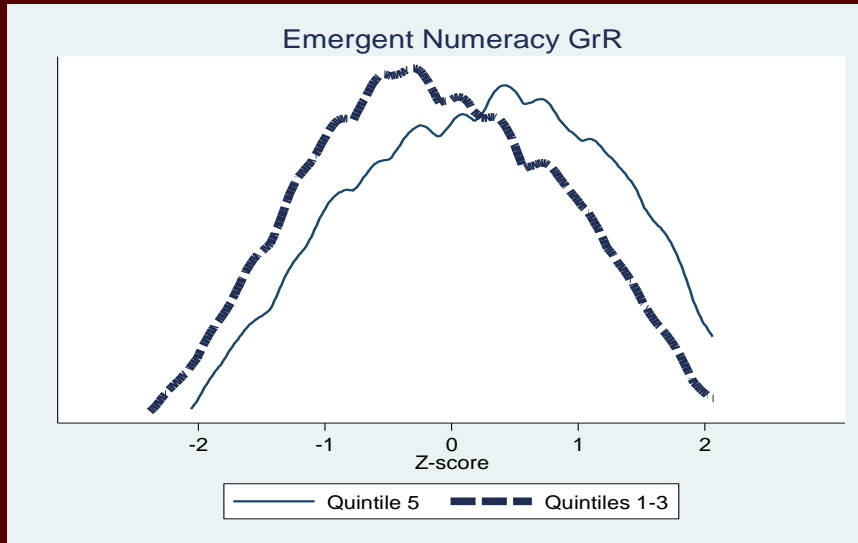
**SIMILAR FINDINGS ACROSS ECD,
GRADE R, GRADES 1-12**

Similarities across education continuum

- Discouragingly, *Thrive by Five* data shows those who had longer ELP exposure had an improved cognitive performance only in ELPs near Quintile 5 (rich) schools
- Van der Berg et al (2014) found negligible gains from participation in Grade R outside the top two school quintiles
- Analysis of most school datasets (SACMEQ, TIMSS, PIRLS, NSES, matric) show two data generating processes: low returns to inputs in lower quintiles
- This again raises the question of the **quality** of many ELPs, as did the Grade R study about schools

Conclusion: A large part of the education system is functioning too weakly to convert additional resources into systematic gains in outcomes

Performance of Quintiles 1-3 vs Quintile 5 as z-scores for various grades



Cognitive gaps widen across the grades

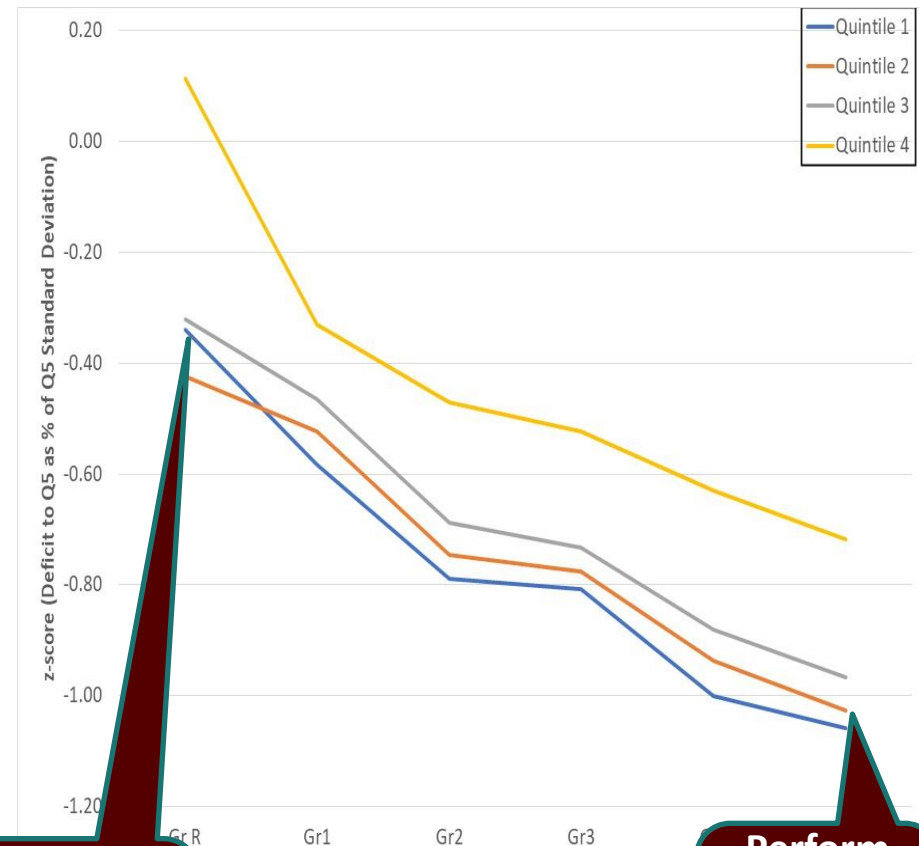
Analysis of ELOM2019 GrR scores & Gr 1-5 scores in ANA2013 finds widening cognitive gaps across the grades:

- Inconsistent with the view that large initial deficits are the problem
- Are poor schools so inefficient that cognitive gaps widen over the school career?

Or:

- Do home and early learning **deficits** perhaps **interact with poor school quality**, causing widening gaps?

Quintiles 1-4 average performance expressed as Quintile 5 z-scores



Perform at 36th percentile of Q5

Perform at 15th percentile of Q5

Why do gaps widen?

- Those starting behind may stay behind due to ‘insurmountable learning deficits’ (Spaull & Kotze, 2015)
- Widening gaps do not necessarily contradict Heckman equation:
 - Schools serving the poor may be unable to convert initial promise into sustained high performance
 - Home and social background may insufficiently support initial gains
 - Shocks to schools, communities and households could wash away early gains
- Good quality ECD programmes may be necessary but insufficient for sustained learning gains

ELP QUALITY

Some evidence on quality

Biersteker et al. (2016) surveyed 242 provincially representative WCape centres: Sub-scales offer insight into quality of care, including some critical dimensions for learning:

- For toddlers and infants: *'Findings indicate very **inadequate quality stimulation** of infants and toddlers.'*
- For children 3 years and older: *'...**provision for stimulation (Activities) and language (Language and Reasoning)** was **within the minimal range...**'*
- Only weekly fees & centre management quality systematically correlated with quality of care

ELOM 2019 (broadly nationally representative Grade R sample)

- For children aged 60-69 months in Quintiles 1-3 in the second term of Grade R, just more than half were 'on track' for entering Grade R (Innovation Edge, 2019)

Quality (cont.)

- Relationship between spending and ELP quality is unclear and probably uneven
- **Staff** appears key, but:
 - ELP staff poorly paid, many below minimum wage
 - Working conditions are often unattractive
 - This causes much churning, with staff entering and leaving the sector
 - **37%** in ECD sector less than 5 years, **28%** unemployed before ECD job
 - Productivity benefits from experience and sector-specific training may therefore not be retained
- Providing lasting improved skills of ECD staff requires much further investigation.

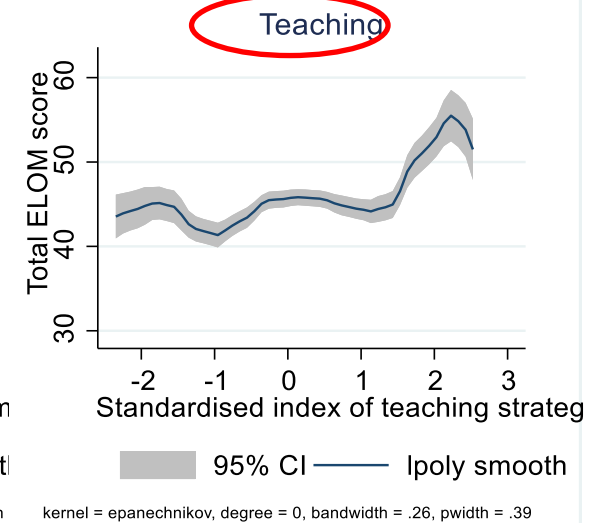
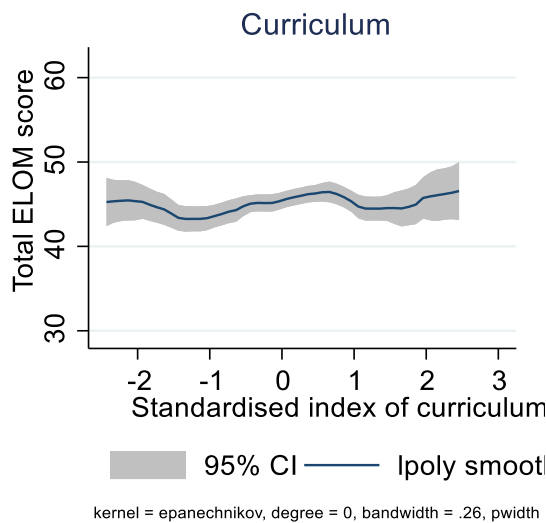
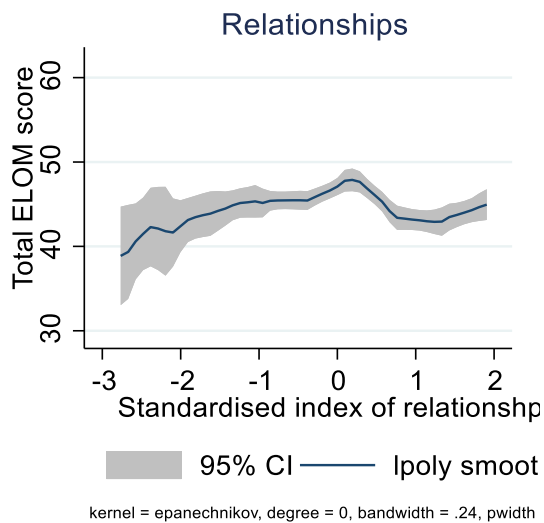
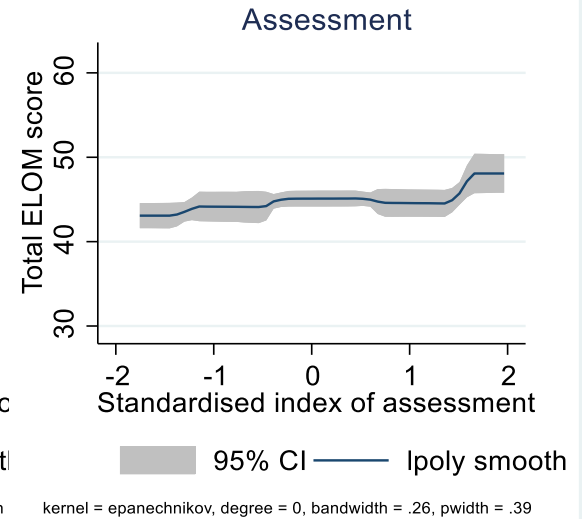
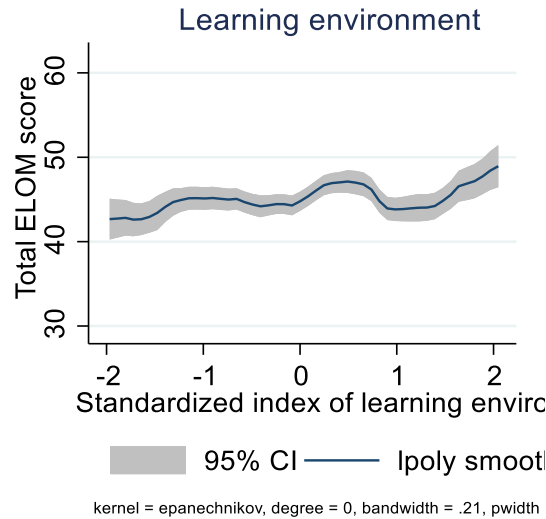
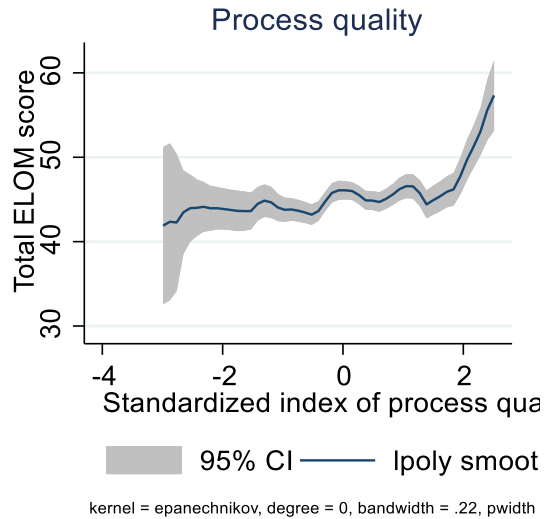
The Thrive by Five surveys, 2021

Representative sample of 50-59 months old children enrolled in ELP. Also, Baseline Assessment in a sub-sample, including **principal questionnaire, practitioner questionnaire, ELP observation and lesson observation** to capture instructional quality.

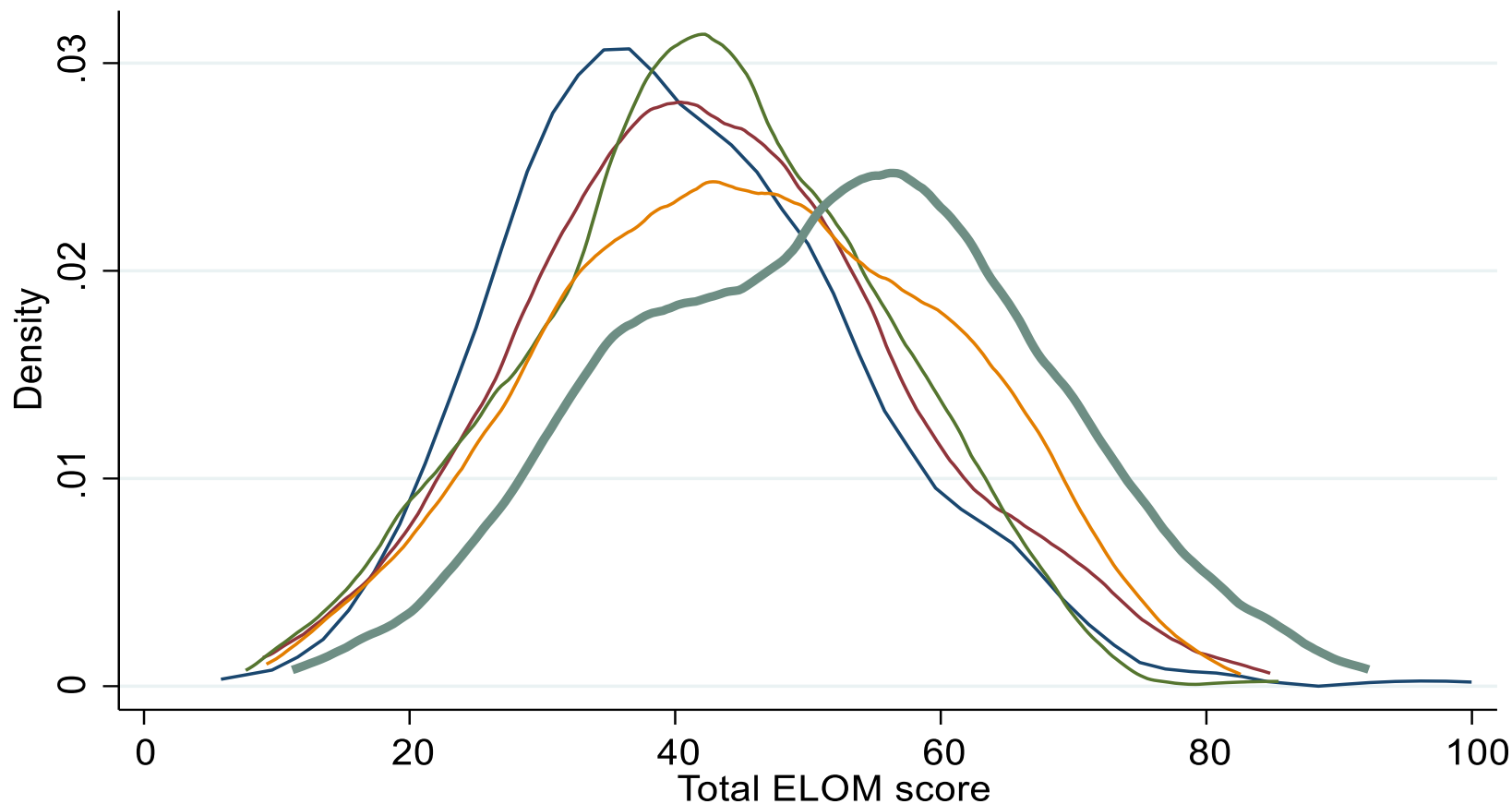
Sub-components of learning programme quality assessment

Learning environment	Playroom divided into different activity areas; availability of variety of age-appropriate materials , accessible to children, that include open-ended materials to promote imagination and problem solving; underpins free choice and play-based approach
Relationship and interactions	Warm, responsive practitioner who acknowledges efforts; encourages positive social relations; uses positive discipline.
Curriculum	Use National Curriculum Framework ; regular & well-balanced daily schedule ; evidence of planning & provision of numeracy and math activities & language & literacy promotion.
Teaching strategies	During free choice time, children have much choice on what to play & what materials to use; staff move around & engage with children during playtime & use a range of techniques to support & extend children's learning ; group times which are practitioner directed allow for child participation ; staff ask open-ended questions to extend children's thinking; staff support children's emotional development.
Assessment of learning and teaching	Children are observed to inform planning and support needs; each child's progress is regularly and systematically monitored in an informal and play-based way.

Process quality and ELOM scores



ELOM scores by SES quintile of fees charged



Fee quintile 1 Fee quintile 2 Fee quintile 3
Fee quintile 4 Fee quintile 5

kernel = epanechnikov, bandwidth = 3.4428

Teaching strategies may raise ELOM scores

	(1)	(2)	(3)	(4)	(5)
Index of structural quality (z-scores)	1.265*	0.746	0.857	1.125	0.956
Index of learning environment (z-scores)	-0.269	-0.0639	0.0178	0.0513	-0.0758
Index of assessment (z-scores)	0.972	0.0153	-0.276	-0.369	-0.364
Index of relationships & interactions (z-scores)	-1.342*	-0.626	-0.717	-0.840	-0.854
Index of curriculum (z-scores)	-1.540*	-1.334	-1.432	-1.168	-0.829
Index of teaching strategies (z-scores)	2.762**	2.293**	2.348**	2.378**	1.517**
SES quintile 2 (Ref: Quintile 1)		3.642**	2.912**	2.829**	3.215**
SES quintile 3 (Ref: Quintile 1)		3.763**	3.199**	2.873*	3.334**
SES quintile 4 (Ref: Quintile 1)		3.375*	3.395*	2.882	5.880***
SES quintile 5 (Ref: Quintile 1)		8.705***	8.400***	7.473***	8.718***
Female (Ref: Male)			1.646*	1.676**	1.835*
Age (months)			0.960***	0.984***	0.896***
Height for age (z-scores)			1.056***	1.048***	0.742**
Conditionally registered (Ref: Registered)				0.205	-0.264
Not registered				3.398	1.192
Registration in process, lapsed or don't know				-0.168	1.289
Previous enrolment (months)					0.0820**
Constant	45.07***	40.82***	-12.13	-13.68	-9.748
Observations	1 933	1 933	1 933	1 933	1 412
R-squared	0.039	0.073	0.122	0.129	0.139

*** p<0.01, ** p<0.05, * p<0.1. Controls for province included, but not shown.

Regressions of teaching strategies index by ELP

	Full sample	Fees<R500	Fees>R500
Fees: R1-R100 (Ref: No fees)	0.217	0.147	n/a
Fees: R101-R200 (Ref: No fees)	0.355	0.284	n/a
Fees: R201-R500 (Ref: No fees)	0.225	0.105	n/a
Fees: R501-R1000 (Ref: No fees)	0.112	n/a	Ref.
Fees: >R1000 (Ref: No fees)	1.407***	n/a	1.360***
Accredited skills programme (Ref: None)	0.748***	0.765***	1.372
NQF 1: ECD	0.466	-0.124	1.701**
NQF 4: ECD	0.365**	0.364*	0.751
NQF 5: ECD	0.404**	0.426**	0.837
NQF 6: Natl Dipl in GrR, Higher Dipl Educ	0.218	0.422	0.498
NQF 7: B-degree, Adv Dipl, B-Tech	-0.849*	0.755**	-0.524
NQF 8/9: Hons, Post-grad Dipl, Master's	2.239***		1.841***
Constant	-0.395	-0.318	0.541
Observations (ELPs)	433	379	54
R-squared	0.142	0.101	0.470

*** p<0.01, ** p<0.05, * p<0.1. Province and registration controls included but not shown.

Regression Skills & teaching strategies index by ELP

Training may improve teaching strategies

	Full sample	Fees<R500	Fees>R500
Fees: R1-R100 (Ref: No fees)	0.217	0.147	-
Fees: R101-R200 (Ref: No fees)	0.355	0.284	-
Fees: R201-R500 (Ref: No fees)	0.225	0.105	-
Fees: R501-R1000 (Ref: No fees)	0.112	-	Ref.
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Teaching strategies

What teaching strategies measure:

*“During free choice time, children have much choice on what to play & what materials to use;
staff move around & engage with children during playtime & use a range of techniques to support & extend children’s learning;
group times which are practitioner directed allow for child participation;
staff ask open-ended questions to extend children’s thinking;
staff support children’s emotional development.”*

Teaching strategies therefore refer to **staff behaviour that can be improved** through incentives, training, education.

The foregoing analysis do not show causal relationships but suggest that good teaching strategies may be a necessary condition for improved cognitive outcomes in poor ELPs.

There is now an urgent need for **interventions** of this nature accompanied by **rigorous impact evaluation**.