

Indonesia's Human Capital Divide

Subnational Conversion Gaps and Digital Readiness

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Flow of the Talk

- Education Reform & National Learning Progress
- Subnational Disparities: Same Reform, Unequal Results
- Understanding Local Conversion Capacity
- Digital Readiness : The Actionable Lever
- Simulation: Learning Gains

Provincial Ranks	North Maluku	West Papua
Literacy	37 → 19	33 → 8
Numeracy	37 → 18	34 → 11

Education Reform in Indonesia

Since 2019, Indonesia has undertaken a major education reform led by the Ministry of Education, shifting the system away from the high-stakes National Examination toward a more student-centered learning and improving learning environment.

CORE REFORMS

- ***Ujian Nasional* discontinued**
High-stakes individual certification replaced
- ***Asesmen Nasional (AN)* introduced**
System-level diagnostic framework
- ***Merdeka Curriculum* launched**
Flexible curriculum enabling differentiated learning
- **Rapor Pendidikan (Education Report)**
Public data dashboards for all schools & districts
- **Student-Centred Learning**
Embedded in teacher training & school leadership

FROM UN → AN

Dimension	Before (UN)	After (AN)
Purpose	Certify students	Diagnose system
Focus	Curriculum content	Literacy, numeracy, character
Stakes	High (graduation)	Low (diagnostic)
Frequency	Once — grades 6, 12, 15	Annual — grades 5, 8, 11
Coverage	All students, final year	Sampled, all schools

AKM Data :Measuring Learning Outcomes Across Indonesian Districts

WHAT AKM MEASURES

Cross-disciplinary foundational skills assessed through contextual problems — not curriculum content. Scores are comparable across schools, districts, and years.

OUR SAMPLE

Grade 11 (Senior High)

Selected as the study cohort because senior secondary participation (~78%) is far higher than tertiary (~33%), making it the most representative cohort of Indonesia's future workforce.

SAMPLE COVERAGE

	2021	2022	2023	2024
Students	45,304	45,480	41,221	48,060
Schools	1,265	1,240	1,137	1,231
Districts	404	402	380	404

Sampling : Stratified random sampling across provinces, school types, and locations.

LITERACY

- Measures students' ability to understand, use, evaluate, and reflect on texts.
- Assesses three reading processes:
 1. Access & identify information
 2. Interpret & understand ideas
 3. Evaluate & reflect on content

NUMERACY

- Ability to reason and solve real-world problems using mathematics
- Domains: algebra, geometry & measurement, data & uncertainty
- Processes: understanding, representing, and using quantities

National Learning Progress Shows Encouraging Results

Literacy Score

2021 - 2024

59.9 → 67.5

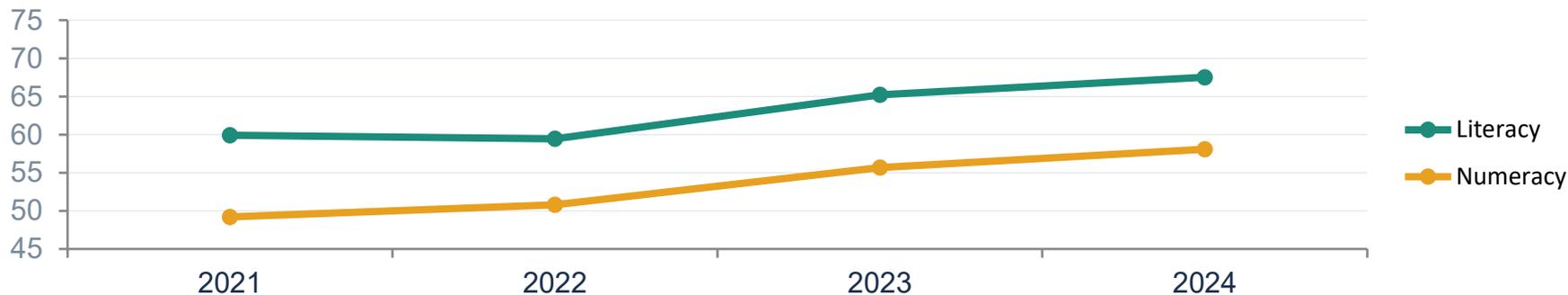
+12.7%

Numeracy Score

2021 - 2024

49.2 → 58.1

+17.9%



Regional Divergence: The Same Reform, Unequal Results



Western Indonesia

Literacy +14.5% · Numeracy +19.8%

Fastest improving region

Central Indonesia

Literacy +12.2% · Numeracy +15.3%

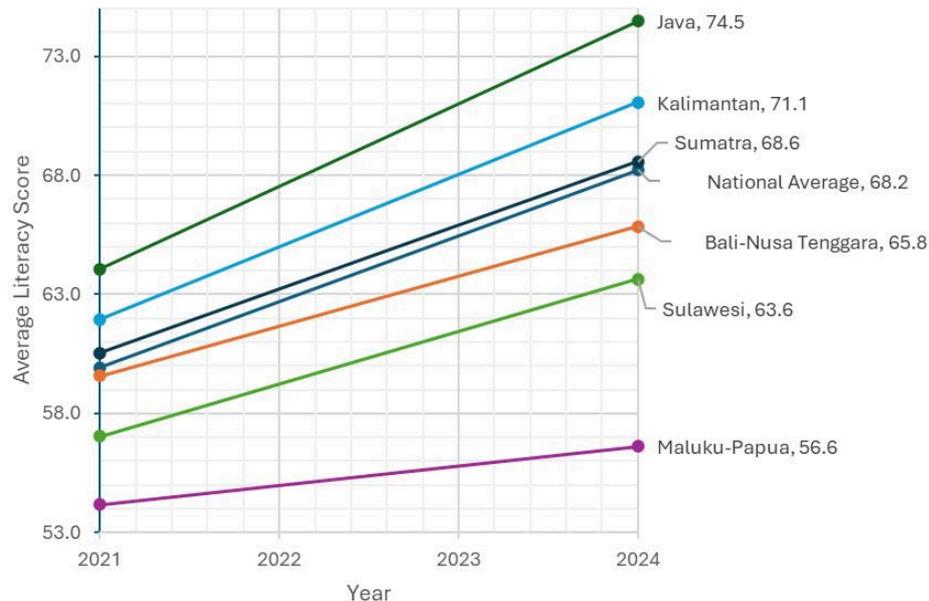
Moderate gains, mixed islands

Eastern Indonesia

Literacy +5.4% · Numeracy +9.2%

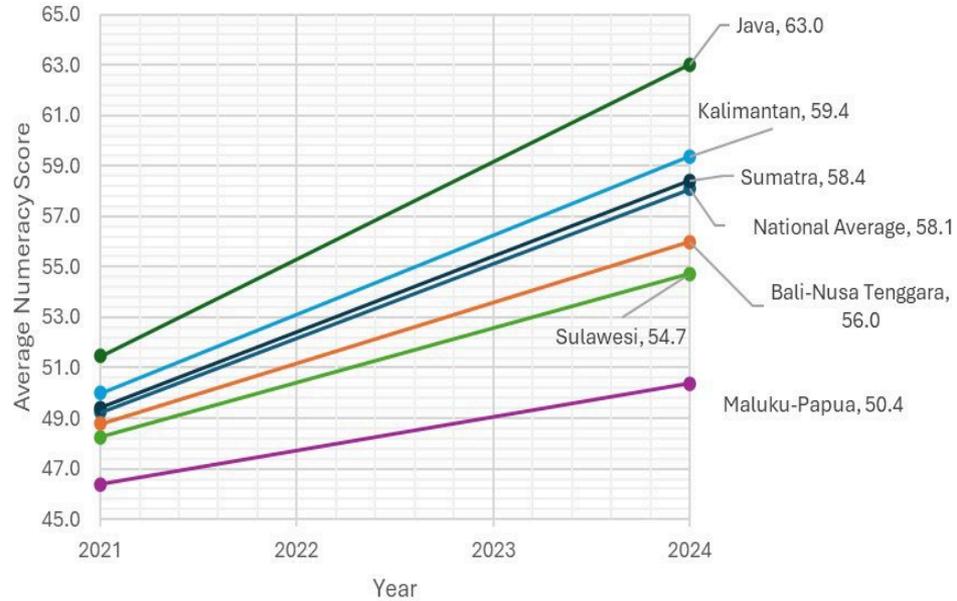
Lagging — less than half the West's rate

Subnational Disparity in Learning Is Widening



(a) Literacy

*Java started highest **AND** improved fastest.
Gap between Java and Maluku-Papua widens.
10 pts in 2021 → ~20 pts in 2024*



(b) Numeracy

*Java leads at 63.0; Maluku-Papua at 50.4.
Eastern regions gaining slower across both metrics.*

Geographic Distribution: Top, Middle, and Bottom Provinces

(a) Literacy



(b) Numeracy



Top 10 Provinces

Heavily concentrated in Java, Kalimantan, and Bali

Middle 14 Provinces

Spread across Java, Sumatra, Kalimantan, and Sulawesi

Bottom 10 Provinces

Predominantly Eastern provinces — Nusa Tenggara, Sulawesi, Maluku and Papua

The Core Question

Same national reforms → Different provincial outcomes

Key explanation:

The Binding Constraint is Differences in Local Conversion Capacity

The ability of local governments, schools, and communities to translate national policy into classroom-level learning gains.



National
Policy Design



Local
Conversion



Learning
Outcomes

How Provinces Convert Resources into Learning : Key Dimensions

01

 **Income & Economic Structure**

02

 **Fiscal Capacity**

03

 **Governance Quality**

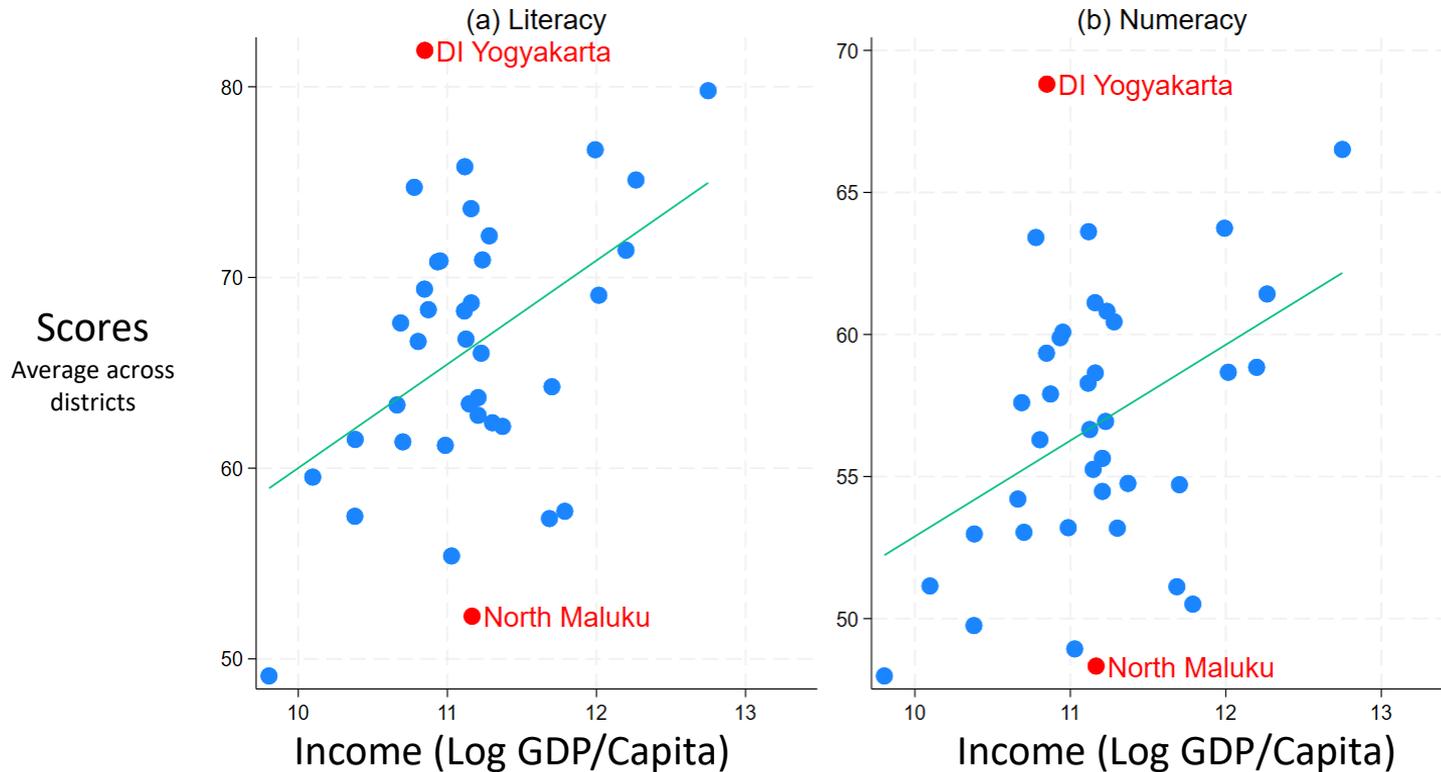
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 **Human Development (HDI)**

05

 **Digital Readiness**

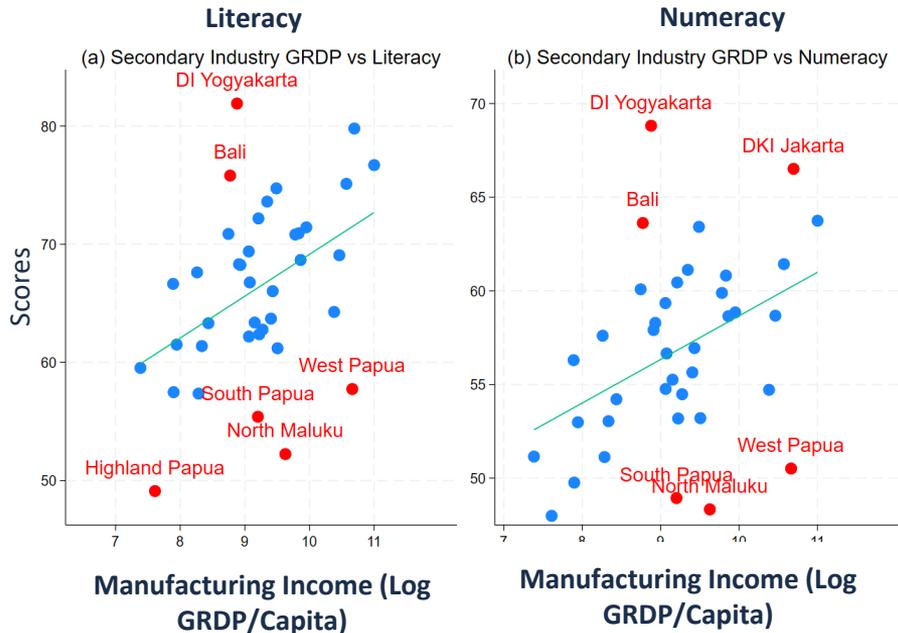
Income helps — but provincial conversion capacity determines outcomes



Provinces with similar income levels show very different learning outcomes

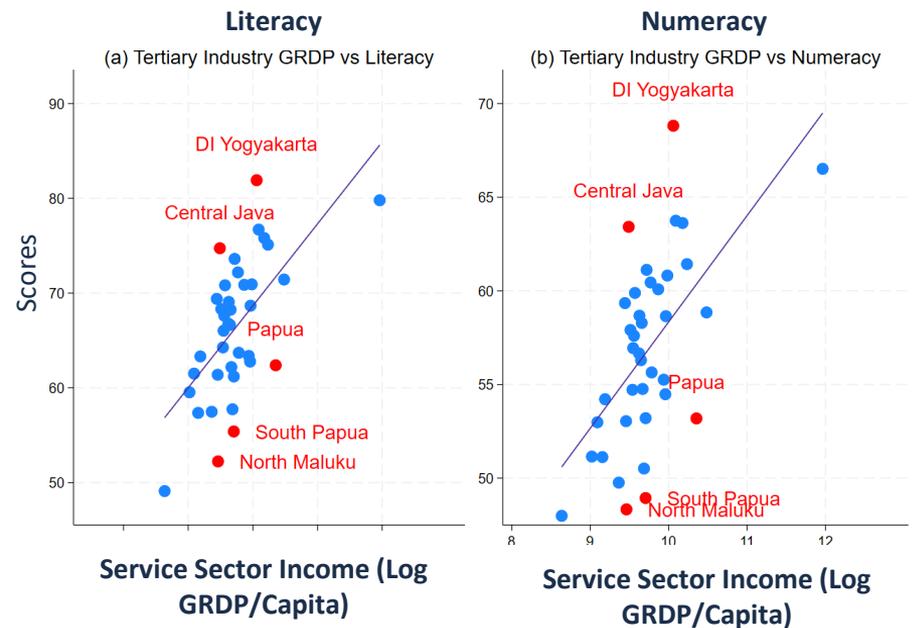
Loose and scattered relationship between manufacturing per capita and scores:

Industrialisation alone does not guarantee skill formation.



Tighter and strong relationship between services per capita and scores:

Education outcomes improve more strongly in service-driven economies.



Economic Structure Enables, Conversion Capacity Determines

What the data shows

Positive association

Higher GDP per capita → higher literacy & numeracy on average

Provincial conversion capacity determines outcomes.

Provincial capacity to translate resources into learning outcomes matters as much as income itself.

Industrialisation alone does not guarantee skill formation

Loose and scattered relationship between manufacturing per capita and scores

Service orientation reinforces skill formation

Service-based economies align more closely with foundational skills

DI Yogyakarta & North Maluku illustrate outlier

Very different learning outcomes despite similar income level

Key implication

Economic structure creates favourable conditions for skill formation. But what ultimately matters is whether provinces can convert these resources into learning outcomes.

DI Yogyakarta

GDP: Low-mid | Literacy: 81.9 ✓ Strong conversion

North Maluku

GDP: Mid | Literacy: 52.2 ✗ Weak conversion

Fiscal Capacity: An Enabling Condition, Not a Guarantee

Local tax revenue is positively associated with learning outcomes — but resources alone do not guarantee effective reform conversion.

✓ Why it helps

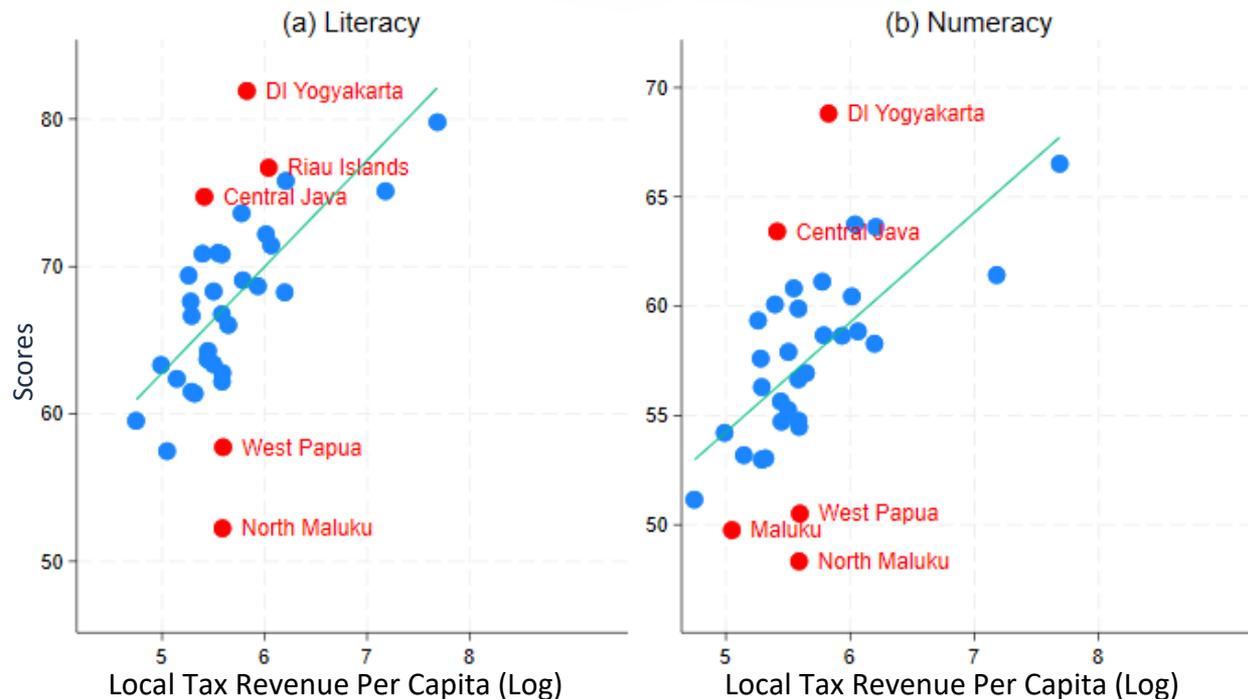
Expands fiscal space for schools & teachers, allowing adaptation of national reforms to local needs

⚠ Why it's not enough

Spending composition matters more than total revenue. Intergovernmental transfers partially offset own-source gaps.

💡 Policy interpretation

Fiscal strength is an enabling condition. How budgets are prioritised and monitored matters as much as size.

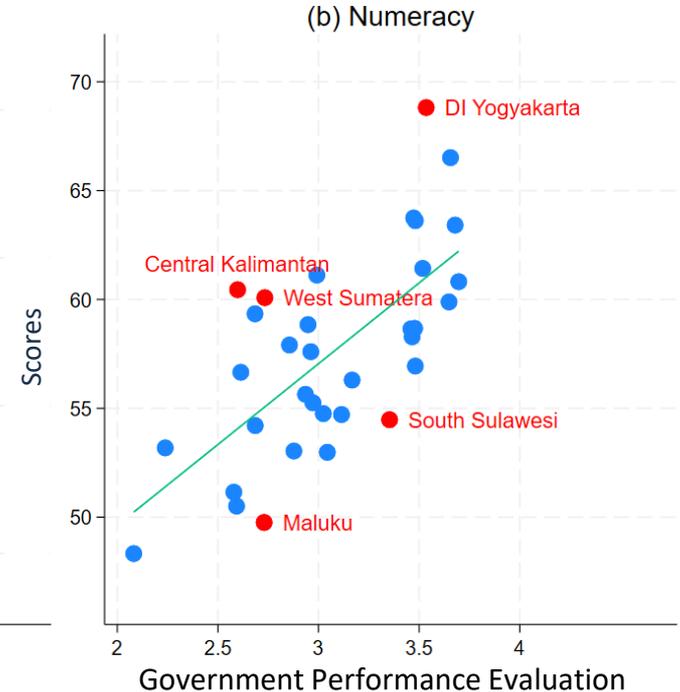
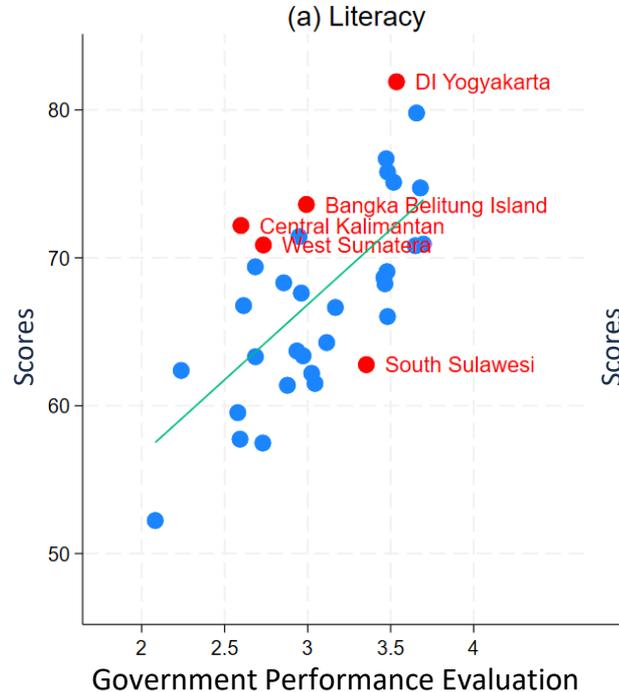


Better Provincial Governance Is Linked to Stronger Learning Outcomes

Governance Quality

Government performance evaluation scores are systematically linked to learning outcomes.

-  Better planning aligns budgets with learning priorities
-  Stronger monitoring improves school management and accountability
-  Reduces teacher absenteeism and enforces instructional standards



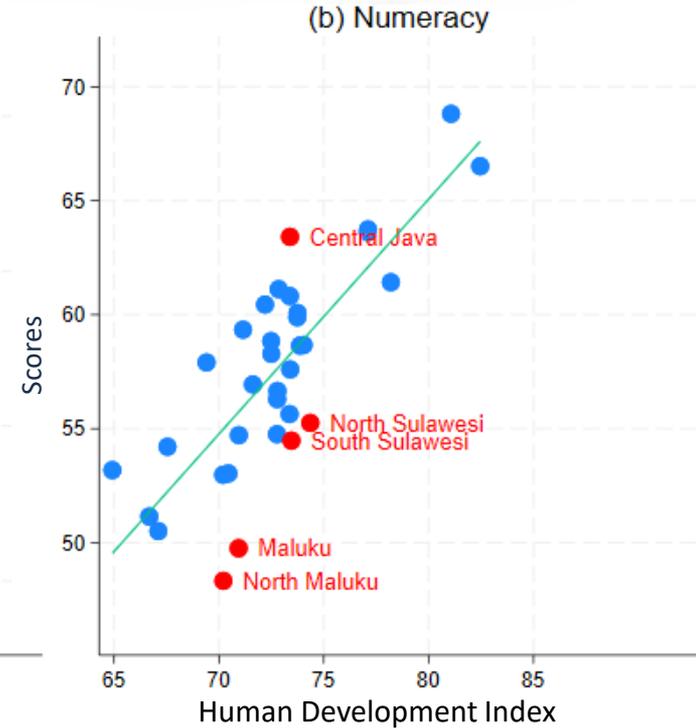
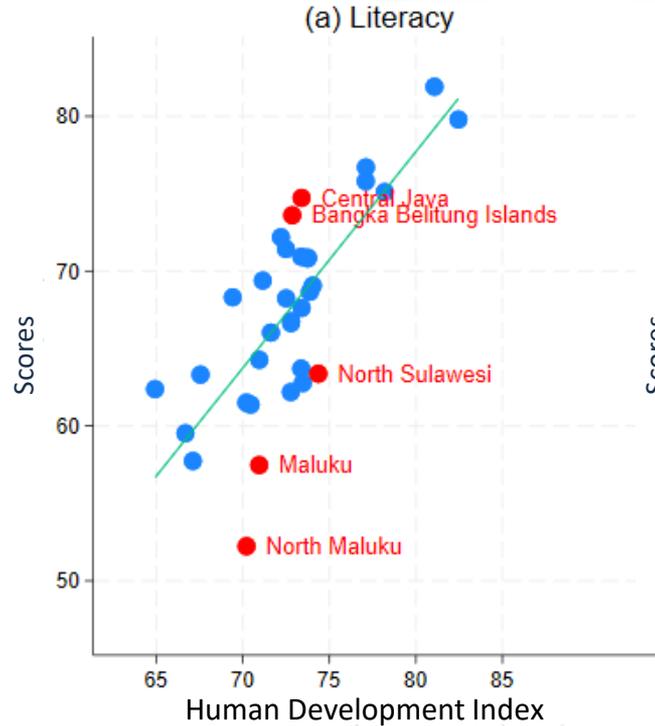
Provinces With Higher Human Development Achieve Better Learning Outcomes



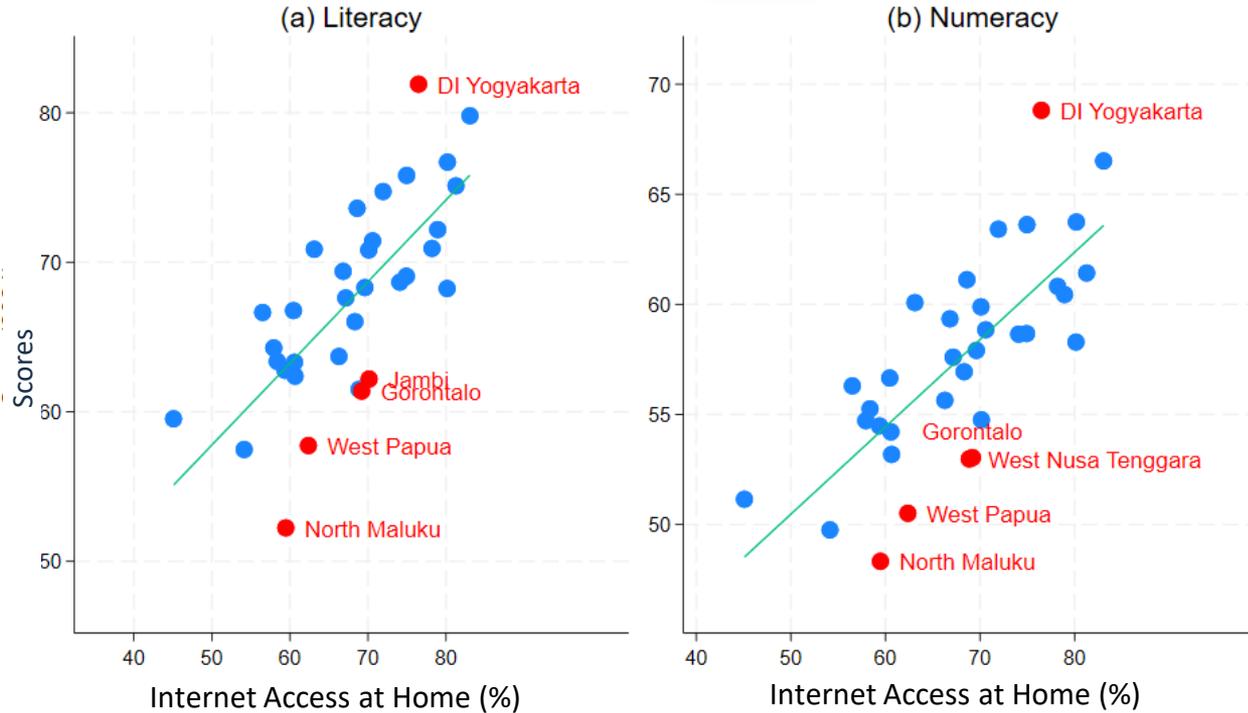
Human Development Index

Strongest structural predictor of literacy & numeracy across all provinces.

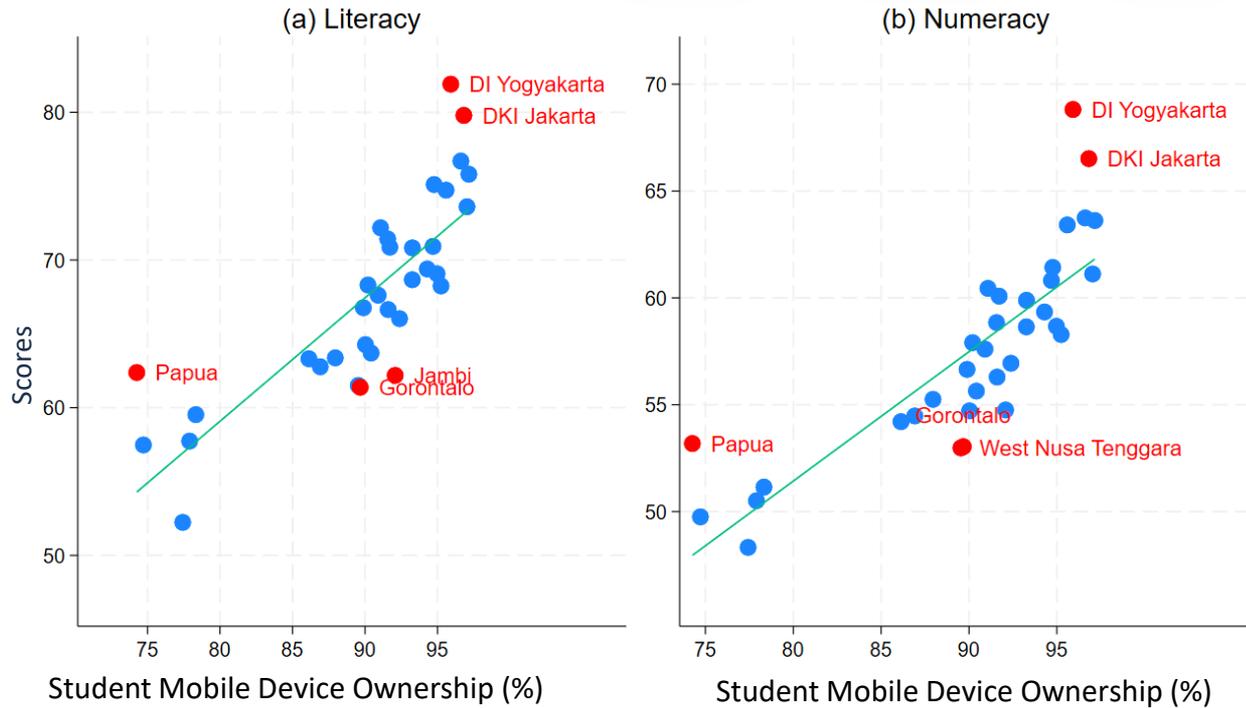
- Healthier children attend school more regularly and absorb more
- Higher household income supports learning resources and home environments
- More educated parents reinforce skills at home (intergenerational transfer)



Digital Readiness : Students with Internet Access at Home Tend to Achieve Higher Learning Outcomes



Digital Readiness : Access to Mobile Devices Supports Better Learning Outcomes



Strong, clean positive relationship — one of the tightest associations observed across both outcomes.

SECTION FOCUS

Digital Readiness (RDDI)

The one lever that cuts across structural constraints

What Is RDDI and Why Does It Matter?

Why digital readiness is different

Operationally deployable

Can be built and scaled in short-to-medium term

Context-adaptable

Works across geographically and institutionally diverse regions

Reform-integrated

Digital systems underpin AKM, Rapor Pendidikan, and teacher training

Threshold-like effect

Below a minimum level, other factors cannot compensate

Equalising potential

Disproportionately benefits lower-income districts

Regional Digital Development Index (RDDI)

ICT Access (3 Indicators)

- Mobile subscriptions per 100
- Households with a computer
- Households with internet at home

ICT Use (7 indicators)

- Share using the internet
- Monthly internet spending
- Monthly mobile credit spending
- Social media engagement
- Share using E-commerce
- Share using e-banking
- Info-seeking behaviour

The Role of Digital Readiness in Local Conversion Capacity

Question 1 – Do digitally ready districts perform better?

Compare districts with different levels of digital readiness, while accounting for income differences.

Econometric Safeguards:

- Digital readiness measured before the pandemic
- Income differences accounted for
- Results averaged across 2021-2024

Question 2 — Does digital readiness matter more in poorer districts?

Quantify how much the learning impact of digital readiness differs between poorer and richer districts.

Econometric Safeguards:

- District characteristics controlled for comprehensively
- Year shocks controlled for
- High-, mid-, and low-income districts analysed separately.

Digital Readiness Empirical Findings

RESULT 1

+1 pt Digital Readiness → +1.6 pts Numeracy

+1 pt Digital Readiness → +2.6 pts Literacy

Cross-sectional association, 326 districts, 2021–2024. Conditional on baseline income (GDP per capita, 2021)

OLS Regression Results

Dependent variable: District mean score, 2021–2024

	MODEL 1	MODEL 2
	Numeracy	Literacy
PreRDDI	1.554^{***} (0.199)	2.618^{***} (0.314)
Baseline log GDP per capita (2021)	-0.059 (0.442)	0.010 (0.733)
Constant	46.760^{***} (1.356)	51.500^{***} (2.268)

Observations	326	326
R ²	0.268	0.285

SE clustered at **district level** **326** districts observed Cross-sectional OLS

^{***} p < 0.001 · ^{**} p < 0.01 · ^{*} p < 0.05

Digital Readiness Empirical Findings

RESULT 2

Digital readiness matters most in lower-income districts, and its advantage grows over time

Interpretation

Digital readiness is often below minimum threshold to support reform implementation in poorer districts

Panel A — Low-income baseline: all $p < 0.001$, coefficients grow 2022→2024

Gold highlight — significant (*) differential: RDDI effect weaker in mid/high-income districts

Red highlight — significant (**) differential: RDDI effect significantly weaker in high-income 2023

Notes: Districts split into terciles by baseline log GDP p.c. (2021). Low-income = omitted group. Standard errors clustered at district level. *** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$

	(1) Numeracy	(2) Literacy
Panel A — Low-income tercile (baseline β)		
PreRDDI × 2022	0.911*** (0.203)	1.148*** (0.310)
PreRDDI × 2023	1.638*** (0.272)	1.753*** (0.374)
PreRDDI × 2024	1.657*** (0.330)	1.766*** (0.439)
Panel B — Differential relative to Low-income tercile		
PreRDDI × Mid × 2022	-0.161 (0.135)	-0.166 (0.218)
PreRDDI × Mid × 2023	-0.479* (0.188)	-0.570* (0.247)
PreRDDI × Mid × 2024	-0.115 (0.223)	0.027 (0.296)
PreRDDI × High × 2022	-0.200 (0.178)	-0.314 (0.295)
PreRDDI × High × 2023	-0.839** (0.253)	-0.843* (0.336)
PreRDDI × High × 2024	-0.415 (0.295)	-0.478 (0.395)
Panel C — Income Controls		
log GDP p.c. (2021) × 2022	-0.355 (0.441)	0.253 (0.606)
log GDP p.c. (2021) × 2023	1.304* (0.564)	1.553* (0.679)
log GDP p.c. (2021) × 2024	0.621 (0.695)	1.103 (0.917)
log GDP p.c. (t) — time-varying	2.165 (3.019)	1.104 (4.349)
Model Specification		
District & Year Fixed Effects	Yes	Yes
Observations	1,304	1,304
R ²	0.864	0.884
Within R ²	0.114	0.085

Stronger Impact in Low-Performing Regions: A Simulation

What does a +10 percentage point increase in digital engagement mean in practice?

Digital Indicator (+10pp)	RDDI Change	Literacy Gain (pts)	Numeracy Gain (pts)
Household Internet Access	+1.4	+3.5	+2.1
General Internet Use	+1.5	+3.9	+2.3
Info-Seeking Internet Use ★	+1.6	+4.2	+2.5
Household Computer Ownership	+1.5	+3.8	+2.3

North Maluku

Now: **Literacy: 52 Numeracy: 48** → **Literacy: 68 Numeracy: 58**

Combined gains: up to 16 literacy points and 9 numeracy points → exits bottom cluster

Provincial Rank:

37 → 19 (Literacy) **37 → 18** (Numeracy)

West Papua

Now: **Literacy: 58 Numeracy: 51** → **Literacy: 73 Numeracy: 60**

Combined gains: literacy could reach mid-70s and numeracy approaches 60 → more than national average

Provincial Rank :

33 → 8 (Literacy) **34 → 11** (Numeracy)

Key Takeaway



National reform is working — literacy and numeracy gains are real and meaningful.



Learning disparities reflect conversion capacity gaps.
Regions that start stronger improve faster.



Multiple factors shape local conversion capacity



Digital readiness is a scalable lever for reducing inequality — uniquely deployable in the short term, with disproportionate impact in lower-income districts.

Reducing the learning divide requires maintaining national standards while systematically strengthening local conversion capacity — starting with digital readiness.

Policy Implications

01 Embed Local Capacity into National Reform Design

- Assess district implementation capacity before rollouts
- Calibrate timelines & support by local readiness
- Allow differentiated support without fragmenting national standards

02 Treat Digital Readiness as Core Reform Infrastructure

- Reliable internet access in low-performing regions
- Meaningful student device availability
- Strengthened digital usage capacity among teachers and administrators
- Monitor digital utilisation — not just connectivity

Thank You

