Learning in Nigeria's Schools: Lessons from In and Out of School Children and a Potential Pedagogical Function
Motivation

“if you cannot measure it, you cannot improve it”  Peter Ducker

- Like most developing countries, Nigeria is mobilizing national and international efforts to meet the sustainable development goal of inclusive and quality education for all.
- Learning profiles allow for tracking of SDG 4 and assessment of optimal policy response.
- Existing learning profiles in Nigeria are based on Adult Retrospective Surveys using Demographic Health Survey and Multiple Indicator Cluster Survey (see Oye, Pritchett, & Sandefur, 2016).
  - How Current? Based on 15-25 years with only primary education.
  - Test mismatch: It tests ability to read a simple sentence about everyday life
  - In-school children are excluded
- Nigerian Education Data Survey is a novel dataset that addresses some of these challenges.
About NEDS Dataset

- National Education Data Survey (NEDS) is the most comprehensive, disaggregated and nationally representative survey on basic education in Nigeria.
- 2015 NEDS is a follow up to the 2013 Demographic and Health Survey (DHS), which is conducted to collect additional data on education from a subset of DHS households.
- The survey has two modules: Parent/Guardian and school age children.
- The same questions were asked of 84832 in-school (pre-primary, primary and junior secondary school) and out-of-school children.
We use 2015 NEDS to generate a contemporaneous cross-sectional learning profile.
Focus on pre- and primary school children and out-of-school children from age 5 to 11 years (based on official primary school age).
The analysis covers a total of 51,180 children.
## Breakdown of Numeracy and Literacy Assessment

<table>
<thead>
<tr>
<th>Numeracy assessment</th>
<th>Literacy Assessment</th>
<th>Expected Grade to attain mastery</th>
<th>Expected Age to attain mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of numbers</td>
<td>Ability to read words</td>
<td>Nursery &amp; Primary 1</td>
<td>6 years</td>
</tr>
<tr>
<td>Addition of numbers which sum to less than 10. E.g. 2+3</td>
<td>Ability to read complete sentences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Addition or subtraction of double-digit problem. E.g. 17+13</td>
<td>Basic comprehension E.g. Answer True/False to one of the three sentences shown</td>
<td>Primary 2</td>
<td>7 years</td>
</tr>
</tbody>
</table>
Learning profile: Learning profile by Grade

Competence in Numeracy by Grade

Competence Literacy by Grade

Identification of numbers
Single digit math problem
Double digit math problem

Reading words
Read sentence
Comprehend
Value addition from Schooling

Double digit math problem

<table>
<thead>
<tr>
<th>% gain in learning from additional year of schooling</th>
<th>Primary 1</th>
<th>Primary 2</th>
<th>Primary 3</th>
<th>Primary 4</th>
<th>Primary 5</th>
<th>Primary 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.96</td>
<td>104.59</td>
<td>72.11</td>
<td>40.01</td>
<td>29.52</td>
<td>20.27</td>
<td></td>
</tr>
</tbody>
</table>

Comprehension

<table>
<thead>
<tr>
<th>% gain in learning from additional year of schooling</th>
<th>Primary 1</th>
<th>Primary 2</th>
<th>Primary 3</th>
<th>Primary 4</th>
<th>Primary 5</th>
<th>Primary 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>68.87</td>
<td>61.62</td>
<td>85.09</td>
<td>39.69</td>
<td>28.19</td>
<td>24.3</td>
<td></td>
</tr>
</tbody>
</table>
Learning profile by Age (Includes Out of School)

Competence in Numeracy by Age Group

Competence Literacy by Age Group
Learning profile for In-school and Out of school Children

Identification of numbers

Single Digit Math Problem

Double Digit Math Problem
Variation in Learning between in-school and out of school children

Proficiency in reading Words

Proficiency in reading sentences

Basic Comprehension
Composite Index of learning

- We develop a composite score by aggregating the students’ performance in literacy and numeracy.
- For literacy, each child was asked:
  1. three questions to test their ability to read and identify words
  2. three questions to test their ability to read complete sentence
  3. a question on the comprehension of one of the sentences in (ii).
- For numeracy, each child was asked:
  1. (i) two questions on the identification of numbers
  2. (ii) two questions on solving of single digit addition problem
  3. (iii) two questions on solving of double-digit addition and subtraction problem.
Composite Index of learning

The composite index is a simple sum of all correct answers to the 13 questions asked.

We set a benchmark of 11 correct answers as the pass mark.
We simulate learning the items on the test using a potential pedagogical function (See Pritchett and Beatty 2012; Kaffenberger and Pritchett).

We model learning ($L$) for pupil, $i$, in grade, $p$, as:

$$L(s_i, h^{(\text{max},p)}, c^p, r^p) = \begin{cases} h^{(\text{max},p)} - [r^p \cdot (c - s_i)] \cdot h^{(\text{max},p)} & \text{if } 0 \leq s_i < 13 \\ 0 & \text{if } s_i \geq 13 \end{cases}$$

$h$ and $r$ are calibrated to match the mean score and standard deviation after each grade.

c is the percentile that gains the most from instruction.
Performance for different grades
Baseline Result versus Dropout variation
Baseline Result versus Increased Width
Baseline Result vs Improved Teaching

Baseline vs Teaching More to More Pupils

<table>
<thead>
<tr>
<th>Simulations</th>
<th>Mean Score</th>
<th>S.D</th>
<th>Pass Rate after Pry 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>4.79</td>
<td>3.60</td>
<td>0.13</td>
</tr>
<tr>
<td>Improve Height and Width in All</td>
<td>19.63</td>
<td>2.98</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Primary 3 (More)

Higher than Baseline (4.79)  Higher than Baseline (0.13)
Baseline Result versus Slower Pace

The diagram illustrates the comparison between baseline results and slower pace test outcomes. The chart shows two distributions: one for the baseline and another for the slower pace condition.

Key points:
- **Baseline vs Slower Pace**
- **Simulations**:
  - Mean Score: Baseline 4.79, Slower Pace 5.13
  - S.D.: Baseline 3.60, Slower Pace 3.23
  - Pass Rate after Primary 2: Baseline 0.13, Slower Pace 0.12

- Higher than Baseline: 4.79
- Lower than Baseline: 0.12

The chart indicates that the slower pace condition results in a higher mean score and pass rate compared to the baseline.
Baseline Result versus Targeting Class mean

![Graph showing Baseline vs Targeting at Class Means]

<table>
<thead>
<tr>
<th>Simulations</th>
<th>Mean Score</th>
<th>S.D</th>
<th>Pass Rate after Primary 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>4.79</td>
<td>1.60</td>
<td>0.13</td>
</tr>
<tr>
<td>Centre at Class Means</td>
<td>6.06</td>
<td>1.56</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Higher than Baseline (4.79)
Lower than Baseline (0.03)

Primary 3 (Class Means Target)
Baseline Result versus Targeting out of school mean
Thank You