Implementing Mother Tongue Instruction in the Real World: Results from a Medium-Scale Randomized Controlled Trial in Kenya

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Kenya Mother Tongue background

- 1976 mother tongue policy
- Policy: pre-K to Grade 3
- Heavy resistance to MT
- MT used very little
- Limited to rural areas
- Can decrease enrollment
- Chose two “homogenous” locations
  - Part of Bungoma county
    - Speaks Lubukusu
  - Machakos county
    - Speaks Kikamba
Language Use by Subject in Early Primary Classrooms

Piper & Miksic 2011
Language Use by Class Level

<table>
<thead>
<tr>
<th>Class</th>
<th>English</th>
<th>Kiswahili</th>
<th>Mother Tongue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>46.8</td>
<td>28.6</td>
<td>24.5</td>
</tr>
<tr>
<td>Class 2</td>
<td>56.9</td>
<td>27.1</td>
<td>16</td>
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<tr>
<td>Class 3</td>
<td>61</td>
<td>28.3</td>
<td>10.7</td>
</tr>
<tr>
<td>Class 4</td>
<td></td>
<td>76</td>
<td>21.2</td>
</tr>
<tr>
<td>Class 5</td>
<td></td>
<td></td>
<td>81</td>
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</table>

Piper & Miksic 2011
PRIMR Mother Tongue Research Design

- Random selection and random assignment at zonal level (groups of 15-20 schools)
- 171 schools in the mother tongue pilot
  - 2 languages used
- EGRA measures varied by language
  - Letter sound fluency
  - Decoding fluency
  - Oral reading fluency
  - Reading comprehension
  - Several other tools that vary by language
- Used weighted data with clustered SEs
- Utilized differences-in-differences analysis
PRIMR Mother Tongue

- Technical support from SIL LEAD
- Pilot in 171 schools
- 2013-2014
- **Larger PRIMR** study in 1384 schools
- Class 1 and 2
- Kikamba (Machakos)
- Lubukusu (Bungoma)
- Random selection and assignment at zone
- 2 days of training total
## Evaluating MT in the “Real World”

<table>
<thead>
<tr>
<th></th>
<th>Typical MT evaluation</th>
<th>PRIMR+MT evaluation</th>
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<tbody>
<tr>
<td><strong>Scale</strong></td>
<td>Small (20-50 schools)</td>
<td>Medium (171 schools)</td>
</tr>
<tr>
<td><strong>Comparison to control</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Comparison to alternative</strong></td>
<td>No</td>
<td>Yes (non-MT PRIMR)</td>
</tr>
<tr>
<td><strong>Sampling</strong></td>
<td>Purposeful</td>
<td>Random (work with what you get)</td>
</tr>
<tr>
<td><strong>Language environment</strong></td>
<td>Focus on MT-only areas</td>
<td>Researches community resistance</td>
</tr>
<tr>
<td><strong>If participants aren’t MT fluent...</strong></td>
<td>Manipulates the environment</td>
<td>Keeps the environment and tests its impact</td>
</tr>
<tr>
<td><strong>Per pupil cost</strong></td>
<td>Significant</td>
<td>Minimal (2 day teacher training and 1:1 books)</td>
</tr>
</tbody>
</table>
Both groups receive

• Learning **materials at 1:1**
  – PRIMR+MT also gets MT
• Support for **TAC tutors**
• **10 days** of teacher training
  – 2 more days for MT
• **TAC tutors use tablets**
• **Assessments in mother tongue**
Additional PRIMR Mother Tongue Inputs

• Learning Materials
  – Pupil book
  – Teachers’ guide
  – Big book (didn’t work well)
  – Supplemental readers

• TAC Tutors
  – Classroom visits and support

• Teachers
  – 2 days of training
  – Observation by TAC tutors
  – Reflection sessions
Yeekesia siitonye ‘kia’ mwikhufwa. Soma likhuwa lioosi.

**kia** luusakia

Soma biitonye bioosi.

- kiaa  kioo  kiee  kiuu
- kia  kio  kie  kiu

Soma buli siitonye. Soma likhuwa lioosi.

- luu sa kia  chee buu sia  lii kia
- luusakia  cheebuusia  liikia

Yeekesia siitonye ‘kia’ mwikhufwa. Soma likhuwa lioosi.

**kia** liikia

Soma biitonye bioosi.

- kie  sie  lie  che
- kiee  siee  liee  chee

Soma buli siitonye. Soma likhuwa lioosi.

- chii kho mee li  e lio  Na lia ka
- chiikhomeeli  elio  Naliaka
## PRIMR MT Research Design

<table>
<thead>
<tr>
<th>Intervention Components</th>
<th>Subjects Supported</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
</tr>
<tr>
<td><strong>Treatment Group</strong></td>
<td></td>
</tr>
<tr>
<td>PRIMR</td>
<td>X</td>
</tr>
<tr>
<td>PRIMR + MT</td>
<td>X</td>
</tr>
</tbody>
</table>
Challenges to MT implementation

• One language (Lubukusu) had complex orthographical choices
• 1 TAC tutor did not speak MT at all
• Some teachers did not speak MT
• Community meetings complained about MT
• 1 zone asked to be removed from the MT program
• Limited enthusiasm for MT compared to other subjects
Did it work?
## Endline Comparisons in Mother Tongue

<table>
<thead>
<tr>
<th>Subtask</th>
<th>Lubukusu</th>
<th>Kikamba</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Treatment</td>
<td>Control</td>
</tr>
<tr>
<td>Letter sound fluency (clspm)</td>
<td>22.1</td>
<td>9.9</td>
</tr>
<tr>
<td>Syllable fluency (cwpm)</td>
<td>21.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Decoding fluency (cwpm)</td>
<td>9.6</td>
<td>3.9</td>
</tr>
<tr>
<td>Oral reading fluency (cwpm)</td>
<td>9.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Reading comprehension (%)</td>
<td>13.2</td>
<td>4.7</td>
</tr>
<tr>
<td>Listening comprehension (%)</td>
<td>60.5</td>
<td>38.8</td>
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</tbody>
</table>
PRIMR+MT Effects on Class 2 Literacy

Letter Sound Fluency (clpm) 19.6
Syllable Fluency (cspm) 8.0 7.6
Nonword Fluency (cwpm) 3.3 5.3
Oral Reading Fluency (cwpm) 7.4 5.3
Reading Comprehension (% correct) 18.0 3.9

Kikamba  Lubukusu

Piper et al 2016
Comparing PRIMR and PRIMR+MT (Kikamba) Effects

- **Letter Sound Fluency (clpm)**: PRIMR 22.5, PRIMR+MT 19.6
- **Syllable Fluency (cspm)**: PRIMR 6.3, PRIMR+MT 8.0
- **Nonword Fluency (cwpm)**: PRIMR 2.5, PRIMR+MT 3.3
- **Oral Reading Fluency (cwpm)**: PRIMR 0.1, PRIMR+MT 7.4
- **Reading Comprehension (% correct)**: PRIMR 0.2, PRIMR+MT 18.0

2016 CER article
Comparing PRIMR and PRIMR+MT (Lubukusu) Effects

- Letter Sound Fluency (clpm): PRIMR 5.6, PRIMR + MT 9.0
- Syllable Fluency (cspm): PRIMR 3.8, PRIMR + MT 7.6
- Nonword Fluency (cwpm): PRIMR 0.7, PRIMR + MT 0.8
- Oral Reading Fluency (cwpm): PRIMR 5.3, PRIMR + MT 5.3
- Reading Comprehension (% correct): PRIMR -4.3

2016 CER article
PRIMR+MT Effect Sizes

- Kikamba
  - Class 1: PRIMR 0.35, PRIMR + MT 0.37
  - Class 2: PRIMR 0.33, PRIMR + MT 0.52

- Lubukusu
  - Class 1: PRIMR 0.32, PRIMR + MT 0.56
  - Class 2: PRIMR 0.10, PRIMR + MT 0.48

2016 CER article
PRIMR Mother Tongue Findings

• **Significant** and meaningful impact on MT literacy outcomes
• However, MT **can** be improved with a English & Kiswahili only program
• Children **transfer** decoding skills to MT
• However, MT **comprehension** requires learning in mother tongue
• MT **can improve** MT results even in complex language environments
Answer the key question:

What is the impact of MT on other subjects?
PRIMR+MT Impact on Other Subjects

• Based in the real world
• English, Kiswahili and Mathematics
• Did not develop materials in MT
• Did encourage teachers to use MT to teach those subjects
• Did not “force” them to do so
• Provided support to teachers consistently
What was the impact of PRIMR+MT…

• On language usage
• On learning outcomes in other subjects
MT Language Use in English & Kiswahili (post-test)

**Percentage of Snapshots Using Mother Tongue**

- **English**
  - Control: 6.9%
  - PRIMR: 2.3%
  - PRIMR+MT: 1.8%

- **Kiswahili**
  - Control: 1.1%
  - PRIMR: 1.5%
  - PRIMR+MT: 1.6%
### Percentage of Language Use in Mathematics

<table>
<thead>
<tr>
<th>Language</th>
<th>Control Baseline</th>
<th>PRIMR Baseline</th>
<th>PRIMR+MT Baseline</th>
<th>Control Endline</th>
<th>PRIMR Endline</th>
<th>PRIMR+MT Endline</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>80%</td>
<td>79%</td>
<td>82%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kiswahili</td>
<td>64%</td>
<td>79%</td>
<td>67%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Language Use Across Time

- **Control**
  - English: 80%
  - Kiswahili: 64%

- **PRIMR**
  - English: 79%
  - Kiswahili: 79%

- **PRIMR+MT**
  - English: 82%
  - Kiswahili: 67%

**Mother Tongue**

- English: 5%
- Kiswahili: 15%

**Kiswahili**

- Control: 0%
- PRIMR: 2%
- PRIMR+MT: 1%

- Control: 0%
- PRIMR: 21%
- PRIMR+MT: 19%

- Control: 0%
- PRIMR: 21%
- PRIMR+MT: 17%

- Control: 0%
- PRIMR: 21%
- PRIMR+MT: 21%
Changes in Mother Tongue Language Use by Area

Change in Mother-Tongue Use (Oct 2013-Oct 2014)

- Control: 12% increase
- PRIMR: 5% increase
- PRIMR+MT: 10% increase

Legend:
- Teacher
- Student
- Materials

Note: Data indicates changes in language use by area, with specific percentages for teachers, students, and materials.
Impact of PRIMR+MT?

- Looking at PRIMR+MT impact on other subjects
- English, Kiswahili and Mathematics
- Compared against non-MT PRIMR
- The key comparison – PRIMR vs. PRIMR+MT
<table>
<thead>
<tr>
<th>Subject</th>
<th>Task</th>
<th>Overall Effect</th>
<th>Grade 1 effect</th>
<th>Grade 2 effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Letter fluency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-word fluency</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Oral reading fluency</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Reading comprehension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% at benchmark</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Kiswahili</td>
<td>Letter fluency</td>
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<tr>
<td></td>
<td>Non-word fluency</td>
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<td></td>
<td>Oral reading fluency</td>
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<td>Reading comprehension</td>
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<tr>
<td></td>
<td>Listening comprehension</td>
<td>-.55 SD</td>
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<td>% at benchmark</td>
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<td>Mathematics</td>
<td>Number identification</td>
<td>-.42 SD</td>
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<td>Quantity discrimination</td>
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<td>Missing number</td>
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<td>Word problems</td>
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<td></td>
<td>Addition fluency</td>
<td>-.43 SD</td>
<td>-.48 SD</td>
<td>-.42 SD</td>
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<tr>
<td></td>
<td>Subtraction fluency</td>
<td>-.38 SD</td>
<td>-.40 SD</td>
<td>-.40 SD</td>
</tr>
</tbody>
</table>
PRIMR+MT Findings Summary

- PRIMR+MT had no effect on language use in English or Kiswahili
- PRIMR+MT modestly increased MT language use in mathematics
- MT treatment had no effect on English outcomes
- MT treatment had no effect on Kiswahili outcomes
- MT treatment had a negative effect on Mathematics outcomes
  - Particularly addition and subtraction
  - Several plausible explanations for this
Reflections

- Undertake research in “real world” conditions
- Analyze MT impacts over a longer period
- Using small, controlled studies as evidence for large MT projects may be misguided
- Consider local language demand
- Real world implementation results should inform “best practice”
- Be modest about our promises regarding MT
Questions?
Comments?
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Language use in early primary classrooms of Central province, by urbanicity

Piper & Miksic 2011
Key Elements of PRIMR

Teachers’ Guides

Instructional Support
<table>
<thead>
<tr>
<th>Subject</th>
<th>Subcomponent</th>
<th>Overall DID effect</th>
<th>Overall Effect size</th>
<th>Grade 1 DID effect</th>
<th>Grade 1 Effect size</th>
<th>Grade 2 DID effect</th>
<th>Grade 2 Effect size</th>
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</thead>
<tbody>
<tr>
<td>English</td>
<td>Letter fluency</td>
<td>0.3 (2.6)</td>
<td>0.02</td>
<td>-0.3 (2.7)</td>
<td>-0.02</td>
<td>-0.0 (3.3)</td>
<td>0.00</td>
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<tr>
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<td>Non-word fluency</td>
<td>1.6 (1.8)</td>
<td>0.16</td>
<td>-0.4 (1.4)</td>
<td>-0.05</td>
<td>3.8 (2.5)</td>
<td>0.32</td>
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<td>Oral reading fluency</td>
<td>1.8 (2.6)</td>
<td>0.11</td>
<td>0.0 (1.8)</td>
<td>0.00</td>
<td>4.1 (4.0)</td>
<td>0.21</td>
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<td></td>
<td>Reading comprehension</td>
<td>1.8 (2.0)</td>
<td>0.14</td>
<td>-0.5 (1.7)</td>
<td>-0.06</td>
<td>4.6 (2.9)</td>
<td>0.29</td>
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<tr>
<td></td>
<td>% at benchmark</td>
<td>2.6 (4.4)</td>
<td>0.09</td>
<td>-0.9 (3.3)</td>
<td>-0.05</td>
<td>7.1 (6.9)</td>
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<tr>
<td>Kiswahili</td>
<td>Letter fluency</td>
<td>-0.7 (2.8)</td>
<td>-0.05</td>
<td>0.7 (2.7)</td>
<td>0.06</td>
<td>-1.9 (3.6)</td>
<td>-0.11</td>
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<tr>
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<td>Syllable fluency</td>
<td>-0.0 (3.1)</td>
<td>0.00</td>
<td>-1.6 (2.7)</td>
<td>-0.12</td>
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<td>Non-word fluency</td>
<td>0.9 (1.5)</td>
<td>0.10</td>
<td>-0.6 (1.1)</td>
<td>-0.10</td>
<td>2.8 (2.3)</td>
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<td>2.9 (2.4)</td>
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<td>0.5 (1.8)</td>
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<td>5.8 (3.7)</td>
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<td>Listening comprehension</td>
<td>-7.2 (4.8)</td>
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<td><strong>-11.5</strong> (5.0)</td>
<td>-0.55</td>
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<td>5.9 (7.8)</td>
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<td>Mathematics</td>
<td>Number identification</td>
<td>-1.5 (1.3)</td>
<td>-0.21</td>
<td><strong>-2.3</strong> (1.2)</td>
<td>-0.42</td>
<td>-0.4 (1.7)</td>
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<td>Quantity discrimination</td>
<td>-4.1 (6.5)</td>
<td>-0.17</td>
<td>-4.1 (6.8)</td>
<td>-0.20</td>
<td>-3.2 (7.2)</td>
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<tr>
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<td>Missing number</td>
<td><strong>-4.1</strong> (2.3)</td>
<td>-0.26</td>
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<td>-5.0 (3.0)</td>
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<td>Word problems</td>
<td>-5.5 (5.0)</td>
<td>-0.26</td>
<td>-7.9 (5.5)</td>
<td>-0.43</td>
<td>-2.3 (5.3)</td>
<td>-0.10</td>
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<td></td>
<td>Addition fluency</td>
<td><strong>-1.7</strong> (0.6)</td>
<td>-0.43</td>
<td><strong>-1.6</strong> (0.7)</td>
<td>-0.48</td>
<td><strong>-1.6</strong> (0.8)</td>
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<tr>
<td></td>
<td>Subtraction fluency</td>
<td>-1.3 (0.5)</td>
<td>-0.38</td>
<td><strong>-1.1</strong> (0.6)</td>
<td>-0.40</td>
<td><strong>-1.4</strong> (0.7)</td>
<td>-0.40</td>
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