# Evidence-based And Endogenous Curriculum Development

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# History of international assistance

- International assistance started in 1960 as UN's first development decade

- The remarkable international collaboration: Education for all in 1990, MDGs in 2000, SDGs in 2015

- Shift of focus in International assistance: Basic education, Institution and ownership, Monitoring the progress
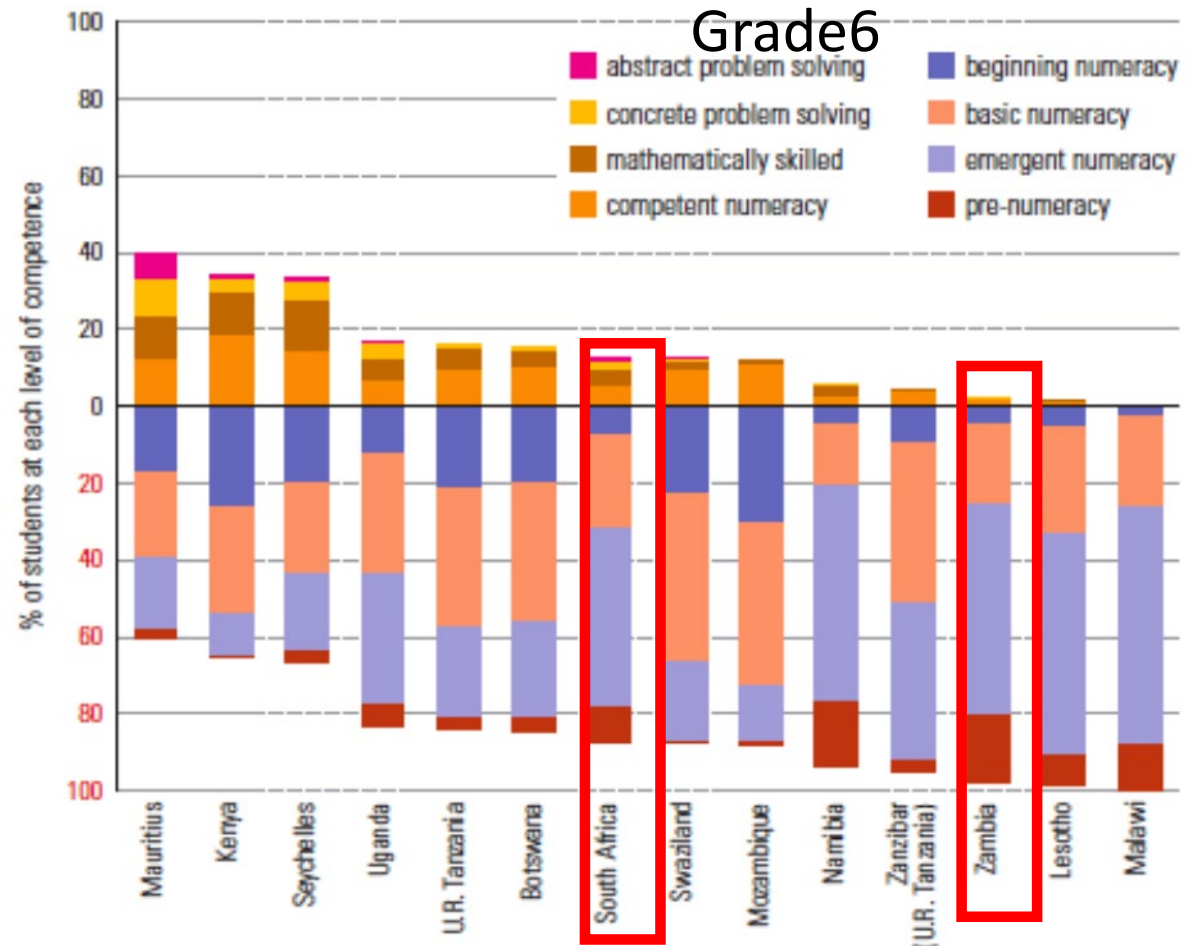
# International and regional assessment

| **Average score** | **374** |
|---|---|
| 25% score | 301 |
| 75% score | 439 |

SACMEQ
South Africa, Zambia
Grade6



Note: Countries are sorted in increasing order of the proportion scoring at the four lowest levels.
Source: UNESCO Institute for Statistics calculation based on SACMEQ II database.

# Questions regarding education assessment

- Can international education assessment <span style="color:red">appropriately assess</span> children in terms of the focus of the curriculum in the respective country?

- Can the respective countries <span style="color:red">utilize the results</span> of international assessment for curriculum improvement?

- How is the reality of Zambian pupils?

# Some findings from our previous study



(G5 to G7)

Whether correct or wrong, there are different levels of strategies

# Role of local expert

Local experts create knowledge based on practice
(Baba & Nakai, 2011)

| Modernization Theory | Endogenous development |
|---|---|
| **External Expert:**<br>New Knowledge from Outside | **External Expert:** ? |
| **Local Expert:**<br>Importation of New Knowledge from Outside | **Local Expert:**<br>Theorization of Wisdom of Practice through Examination of Knowledge from Outside |
| **Practicing Teacher:**<br>Reception of Knowledge from Outside | **Practicing Teacher:**<br>Creation of Wisdom of Practice |

# JICA research project on Zambian students' numeracy (2018-2021)

- Knowledge creation requires <span style="color:red">professional discussion based on data and evidence</span>. The objective is to develop an assessment tool for Grade 1 to 4 students' numeracy competence.
  - Clements & Sarama (2013) described <span style="color:red">stepwise development</span> of children's understanding using the idea of learning trajectory.
  - Mulligan & Mitchelmore (2009; 2013) developed an assessment method for early mathematical competence from the <span style="color:red">pattern and structure</span>.
  - Roberts (2015) identified five <span style="color:red">representation types</span> and a persistent problem of counting-all strategy.
- Joint research project between University of Zambia and Hiroshima University funded by JICA.

# Exploratory Research method

| | | Developmental stage | | | | Final stage | |
|---|---|---|---|---|---|---|---|
| | | 2018 | | 2019 | | 2021 | |
| | | Mar. | Sep. | Mar. | Sep. | Mar. | Jun. |
| | | 1st Cycle | 2nd Cycle | 3rd Cycle | 4th Cycle | Pre- | Post- |
| No. of Schools | | 2 | 2 | 4 | 4 | 10 | 10 |
| | Grade 1 | 8 | 8 | 16 | 16 | 20 | 20 |
| No. of | Grade 2 | 8 | 8 | 16 | 16 | 20 | 20 |
| Students | Grade 3 | 8 | 8 | 16 | 16 | 20 | 20 |
| | Grade 4 | 8 | 8 | 16 | 16 | 20 | 20 |

- **Developmental stage**
1) Formulate draft tools,
2) Conduct field trials with the draft tools,
3) With analysis of data and revise the draft tools.
- **Final stage**
1) Conduct Pre-study (Baseline survey)
2) Implement Intervention
3) Conduct Post-study (Endline survey)

# Construction of task based interview tool

## [3.1 Composing and decomposing numbers]

Prepares two frames of 10. On one side, place 9 bottle tops and on the other side, place 3 bottle tops.
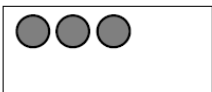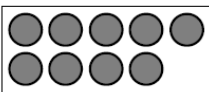
Q. 'How many bottle tops are there altogether? You may move the bottle tops'

Local Language

Tuli tungati tupendelo utu pamodzi; ungatu tatike bwino kuti upendze bwino ansa?

Watantika bwanji?

Altogether?

representation

| Intention of the question | To add bottle tops in two frames in a structured way. |
|---|---|
| Materials | · 2 frames of 10 and 12 white bottle tops |

[Response levels]

| 1 Not at all | S/he tells a wrong answer that is beyond our expectations | |
|---|---|---|
| 2 Partially Implicit | S/he tells the incorrect answers which are closed to the right answer, e.g. 10, 12 | |
| 3 Implicit | S/he can find an answer (12) by counting mentally or physically, not moving bottle tops. | Judge whether counting one by one or not from student's physical actions. |
| 4 Structural | S/he can find an answer (12) by moving bottle tops. | Record the method in the individual observation sheet. [Level 4] In the case of counting one by one, after making 10 and 2 as a group by moving bottle tops. |
| 5 Advanced structural | Besides level 4, s/he also can explain by words using group of 10. | (e.g.) Get one top from 3 and place it on the other frame so that we can get a group of 10. |

Developmental stage

Attention to grouping ten

Viewing structurally

# Sample task "Arrange bottle tops using the mental frame"

| Level 4 |
|---|

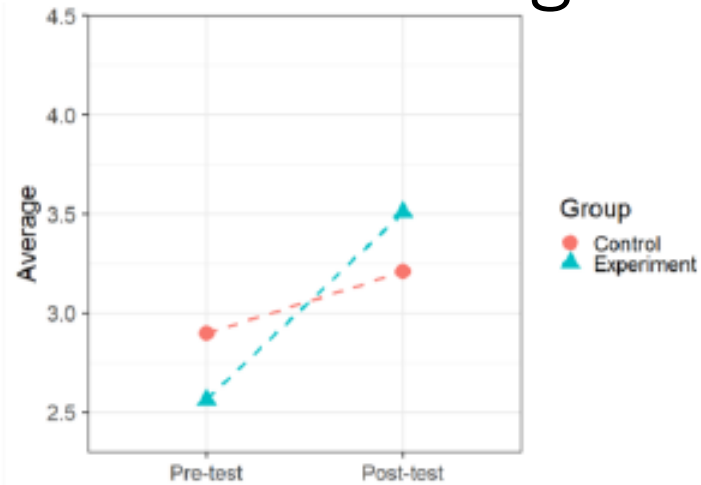| Level 2 |
|---|

# Changes in each grade



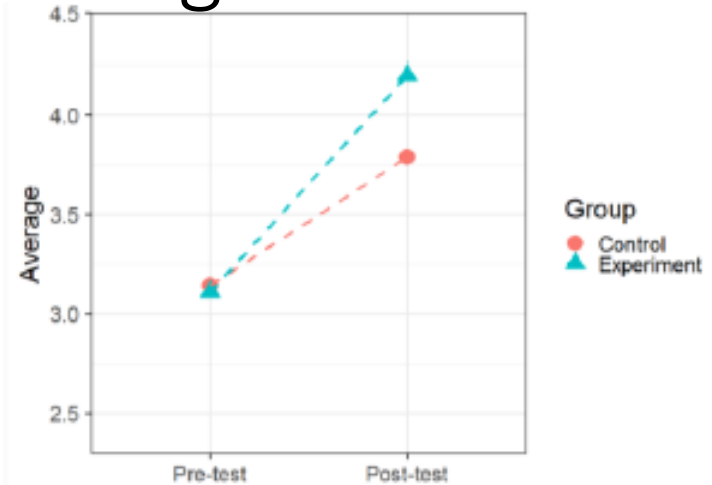Figure 5    Result of grade 1 (11 tasks, N=20)



Figure 6    Result of grade 2 (9 tasks, N=20)
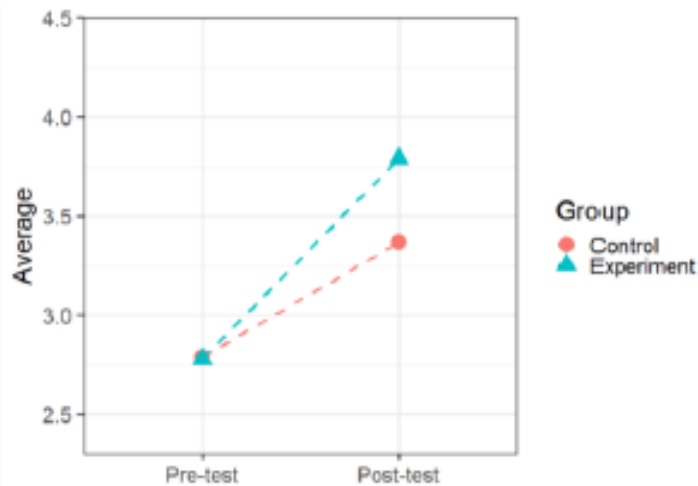


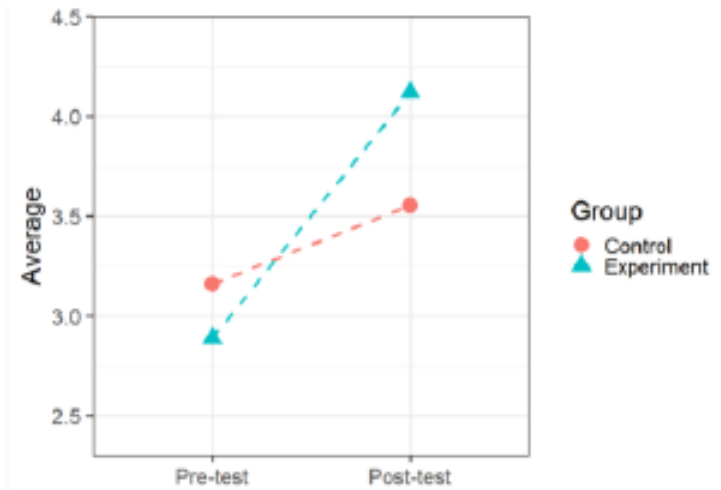Figure 7    Result of grade 3 (20 tasks, N=20)



Figure 8    Result of grade 4 (20 tasks, N=20)

# Changes in each grade (difference of difference)

**Table 15  Differential analysis of interview scores and differences for each grade**

| Grade | Cronbach's α | | | control | | experiment | | Estimated intervention effect | p-value |
|---|---|---|---|---|---|---|---|---|---|
| | all (40) | pre (20) | post (20) | pre | post | pre | post | | |
| G1 | 0.85 | 0.83 | 0.81 | 2.90 | 3.21 | 2.56 | 3.51 | 0.64 | 0.10 |
| G2 | 0.81 | 0.73 | 0.74 | 3.14 | 3.79 | 3.11 | 4.20 | 0.44 | 0.29 |
| G3 | 0.84 | 0.79 | 0.72 | 2.79 | 3.37 | 2.78 | 3.79 | 0.43 | 0.18 |
| G4 | 0.90 | 0.90 | 0.82 | 3.16 | 3.56 | 2.89 | 4.12 | 0.84 | 0.04 ** |
| G3 & G4 | 0.88 | 0.79 | 0.72 | 2.98 | 3.46 | 2.84 | 3.96 | 0.63 | 0.02 ** |
| G1-G4 common items | 0.81 | 0.80 | 0.80 | 3.15 | 3.64 | 3.06 | 4.31 | 0.76 | 0.00 ** |

- ** shows 5% level of statistical significance.

| Change in control G | Change in experimental g | effect |
|---|---|---|
| $3.21 - 2.90 = 0.31$ | $3.51 - 2.56 = 0.95$ | $0.95 - 0.31 = 0.64$ |

- Even control group may have learning effect. Thus difference of difference (change in experimental group) – (change in control group) was calculated.

# Local knowledge from the exploration

- We realize some local knowledge through this exploration process.
- [One example] After confirming ten bottle tops in one frame, and adding one onto an empty frame, we asked the total. The pupil immediately answered 11. Then we asked him the reason, and he paused and started counting one by one. There are some interpretations behind this event.
- [Other examples] Interview questions, Test development
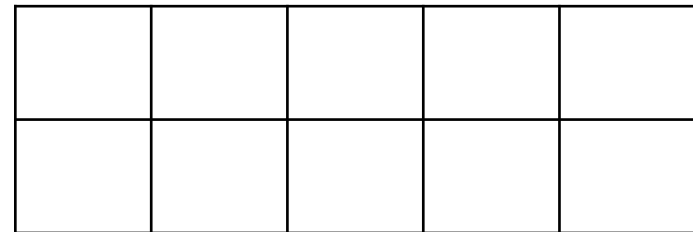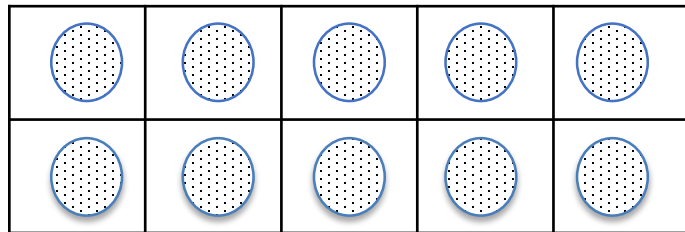
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