IEA's LaNA and Rosetta Stone: Extending the Reach of TIMSS and PIRLS

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Extending TIMSS and PIRLS

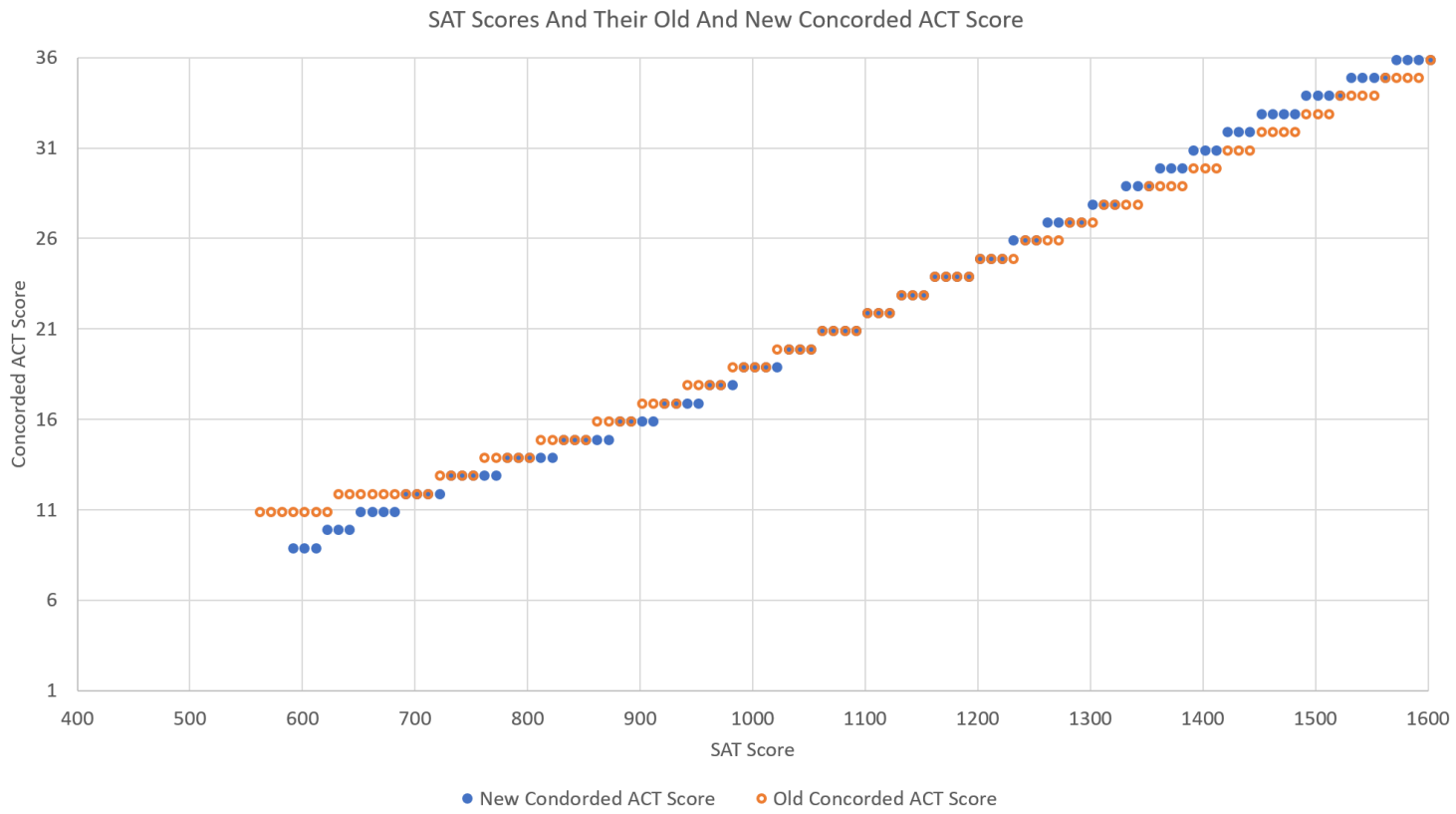
TIMSS and PIRLS achievement scales and benchmarks long established global indicators of student achievement

Two distinct efforts to build on TIMSS and PIRLS:

- LaNA: a new, less difficult Literacy and Numeracy assessment for countries where TIMSS and PIRLS are too difficult
- Rosetta Stone: linking TIMSS and PIRLS to regional assessments – ERCE, PASEC, SACMEQ, SEA-PLM, PILNA
- Address progress toward UN Sustainable Development Goal 4.6
  - Ensure inclusive and quality education for all and promote lifelong learning.
- Linking through concordance tables – projecting TIMSS and PIRLS scores from scores on other assessments

Example Concordance: ACT and SAT

- LaNA and Rosetta Stone concordance tables will be similar to the ACT – SAT example
- Will provide a range of likely TIMSS/PIRLS scores for each LaNA or regional assessment score
  - Account for measurement error



ACT Composite to SAT Total

This table shows a range of SAT scores for each ACT score

ACT	SAT	SAT Range
36	1590	1570-1600
35	1540	1530-1560
34	1500	1490-1520
33	1460	1450-1480
32	1430	1420-1440
31	1400	1390-1410
30	1370	1360-1380
29	1340	1330-1350
28	1310	1300-1320
27	1280	1260-1290
26	1240	1230-1250
25	1210	1200-1220
24	1180	1160-1190
23	1140	1130-1150
22	1110	1100-1120
21	1080	1060-1090
20	1040	1030-1050
19	1010	990-1020
18	970	960-980
17	930	920-950
16	890	880-910
15	850	830-870
14	800	780-820
13	760	730-770
12	710	690-720
11	670	650-680
10	630	620-640
9	590	590-610

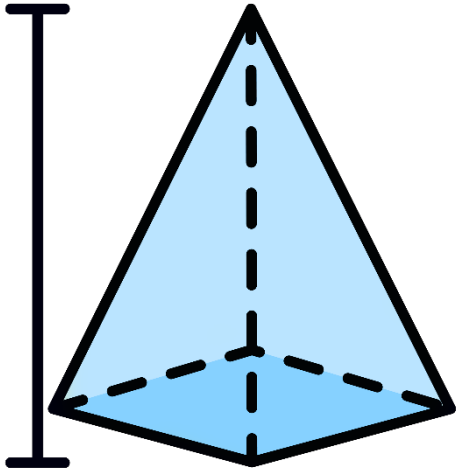
Overview of LaNA

- IEA's new less difficult Literacy and Numeracy assessment, with links to TIMSS and PIRLS
  - *Addresses the same constructs, with shorter, easier items*
- Current LaNA instrument the result of several waves of piloting – now ready for full scale implementation
- IEA seeking 5-10 countries to participate in launch of LaNA
  - Establish the LaNA scale metric
  - Construct concordance tables for LaNA vs TIMSS and PIRLS
  - Establish new "Basic" benchmark, below TIMSS/PIRLS Low International benchmark

LaNA Assessment Framework and Items

Numeracy – based on TIMSS mathematics 4th grade

- Number, Measurement & Geometry, Data
- Mostly Knowing, Applying, some reasoning
- TIMSS items too difficult, so all LaNA items newly developed



Literacy – based on PIRLS reading 4th grade

- Literary and Informational purposes for reading
- Mostly retrieval and straightforward inferencing, some integrating
- All passages and items adapted from PIRLS Literacy – shorter and easier

Extensive Piloting of LaNA Prototypes

- Early versions (LaNA 1.0 and 2.0) piloted in Haiti and Pakistan (2016, 2017)
- Large scale pilots (LaNA 3.0) in Serbia, North Macedonia, Nigeria, and Haiti (2019, 2020)

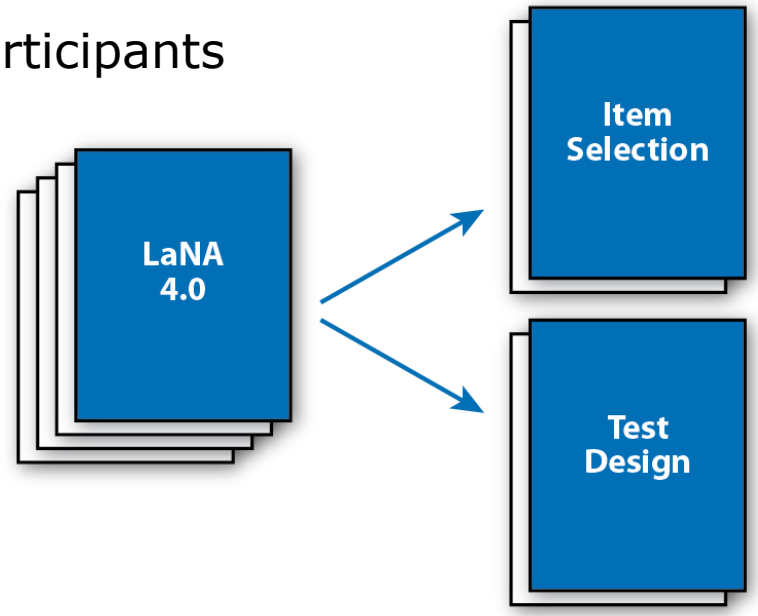
	Countries	N (used for analysis)
LaNA Pilot	Serbia (Grade 3)	1,295
	North Macedonia (Grade 3)	1,196
	Nigeria (Grade 4)	884
	Haiti (Grade 4)	952
	Haiti (Grade 6)	706

LaNA Pilot Data Collection

- Four LaNA booklets
  - Five blocks of Numeracy items (one common)
  - Five literacy passages and items (one common)
- One linking booklet
  - Easy items from TIMSS 2015/2019 and PIRLS 2016
- Data collection design in pilot
  - Two-day model: LaNA and linking booklets on successive days, each student completes one of each

LaNA Pilot Data Analyses and Design

- Extensive analyses of pilot data using classical item anayses and IRT scaling
  - Comparability of the measured constructs across instruments
  - Comparability of the difficulty targets of LaNA and TIMSS/PIRLS
  - Reliability and construct coverage of the constructed scales
  - Fit of TIMSS and PIRLS item parameters for LaNA participants
- LaNA 4.0 assessment instrument finalized based on pilot results
  - Item selection and test design
- LaNA linking design strengthened and finalized



LaNA Booklet Design

- Four blocks Numeracy Items (N1-N4), chained across booklets
- Five Literacy passages (L0, L1-L4), common + unique

LaNA Booklets	Part 1 (40 min)		Part 2 (40 min)	
1	N1	N2	L0_Common	L1
2	L0_Common	L2	N2	N3
3	N3	N4	L0_Common	L3
4	L0_Common	L4	N4	N1

LaNA Linking Booklet Design

- Four blocks less difficult TIMSS Items (NL1-NL4), chained across booklets
- Four PIRLS Literacy passages (LL1-LL4), also chained across booklets

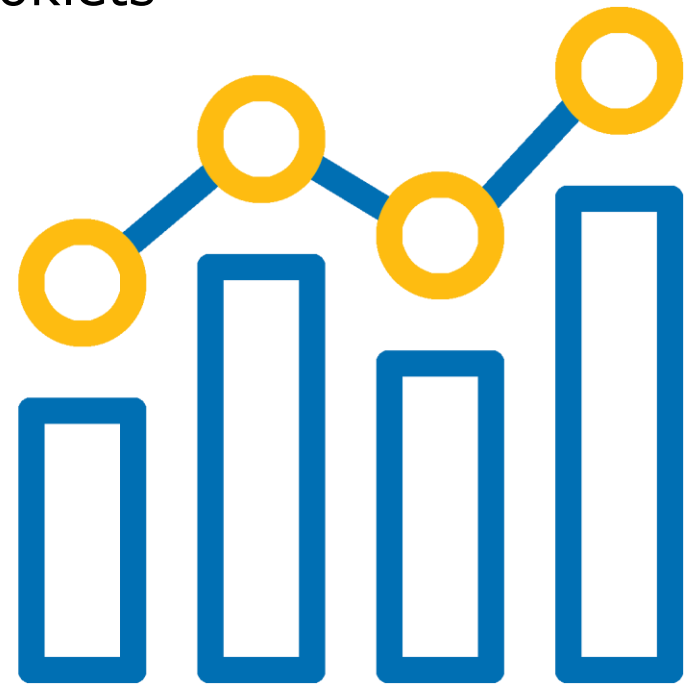
Linking Booklets	Part 1 (40 min)		Part 2 (40 min)	
1	NL1	NL2	LL1	
2	LL2		NL2	NL3
3	NL3	NL4	LL3	
4	LL4		NL4	NL1

LaNA Implementation

- The final LaNA instrument together with the linking booklets will be administered to 5-10 seed countries
- Instruments, administration manuals and scoring guides have been shared with IEA
  - French translations underway
- Senegal the first participating country
  - November 2021

LaNA Implementation (cont.)

- Data collection design
  - One-day model: all 8 (LaNA and linking) booklets distributed in each class
- Data from the seed countries will be used to
  - Establish LaNA scale and scale metric
  - Create LaNA-TIMSS/PIRLS concordance tables
  - Create new "Basic" International Benchmark



Benefits for LaNA Countries

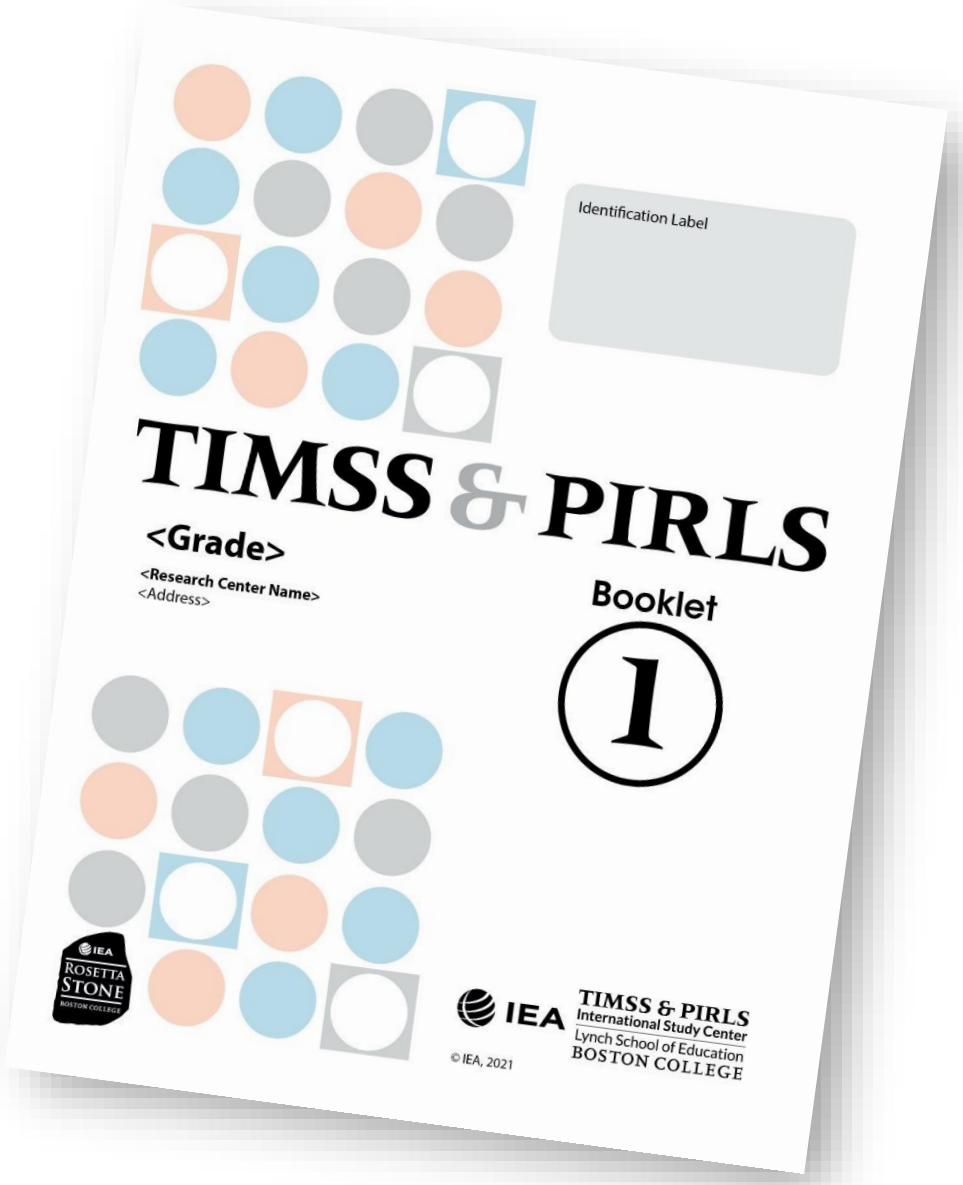
- Reliable, valid, and internationally comparable indicators of student literacy and numeracy
  - Ideal for measuring progress toward SDG 4
- Concordance tables provide LaNA countries' projected scores on TIMSS and PIRLS
  - Also estimates of percentages of students reaching TIMSS and PIRLS International Benchmarks
- Progress toward suitability for participation in TIMSS and PIRLS

Overview of Rosetta Stone

- Objective: "Translate" or link to TIMSS/PIRLS from regional assessments – ERCE, PASEC, SACMEQ, SEA-PLM, PILNA
- Funded by UNESCO, representative countries from two assessments
  - ERCE: Guatemala, Colombia (Chile out due to COVID-19)
  - PASEC: Burundi, Guinea, Senegal
- TIMSS/PIRLS items administered to students participating in ERCE or PASEC
  - Provides psychometric link to establish concordance
- Can report "likely" performance on TIMSS/PIRLS based on ERCE or PASEC results

Rosetta Stone Data Collection

- Students participating in the ERCE or PASEC assessments at sixth grade also were administered TIMSS and PIRLS booklets in a separate session
  - Equivalent sample design
- Eight linking booklets
  - For ERCE, medium and easy items from TIMSS 2015/2019 and PIRLS 2016
  - For PASEC, all easy items from TIMSS 2015/2019 and PIRLS 2016



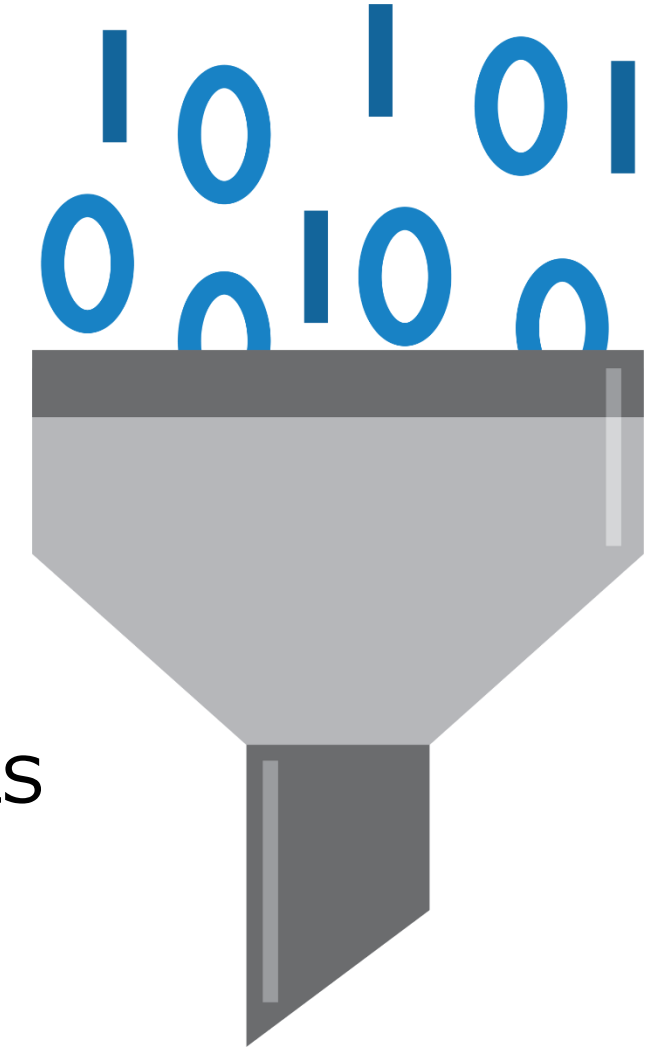
Rosetta Stone Project Status

- Successful administration of Rosetta Stone in 2020 (in spite of delays due to Covid-19)
- Data received from five countries and processed for analysis

	Countries	N (used for analysis)
ERCE	Guatemala (Grade 6)	3,144
	Colombia (Grade 6)	5,340
PASEC	Burundi (Grade 6)	2,271
	Guinea (Grade 6)	2,207
	Senegal (Grade 6)	2,059

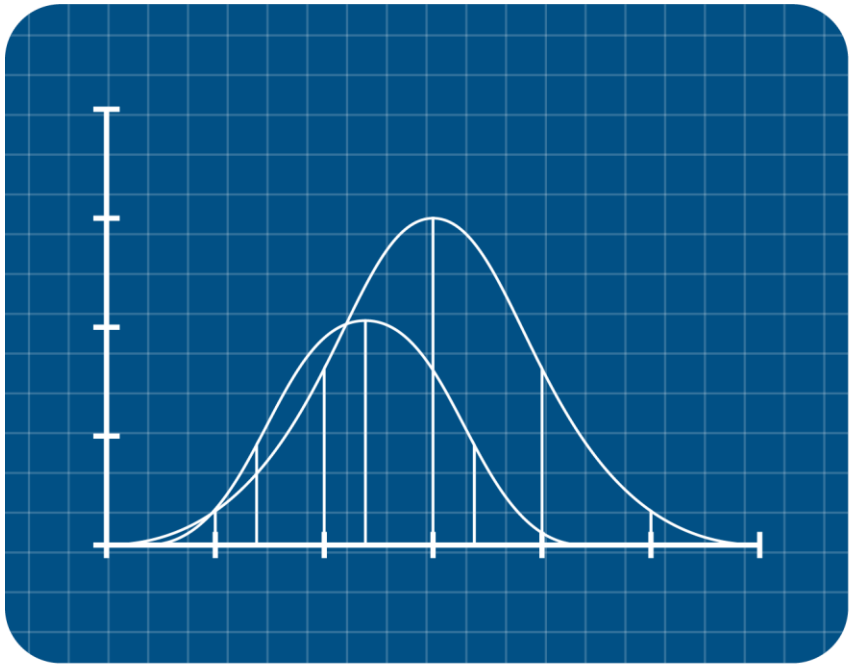
Data Quality and Analysis

- Rosetta Stone requires careful analysis and review of the data in order to determine:
  - The quality of the data base for comparison between national and international assessments
  - The psychometric quality of the items
  - The measurement accuracy (measurement error)
- This is done by applying standard TIMSS/PIRLS data quality control procedures, statistical analysis and psychometric models



Psychometric Analyses

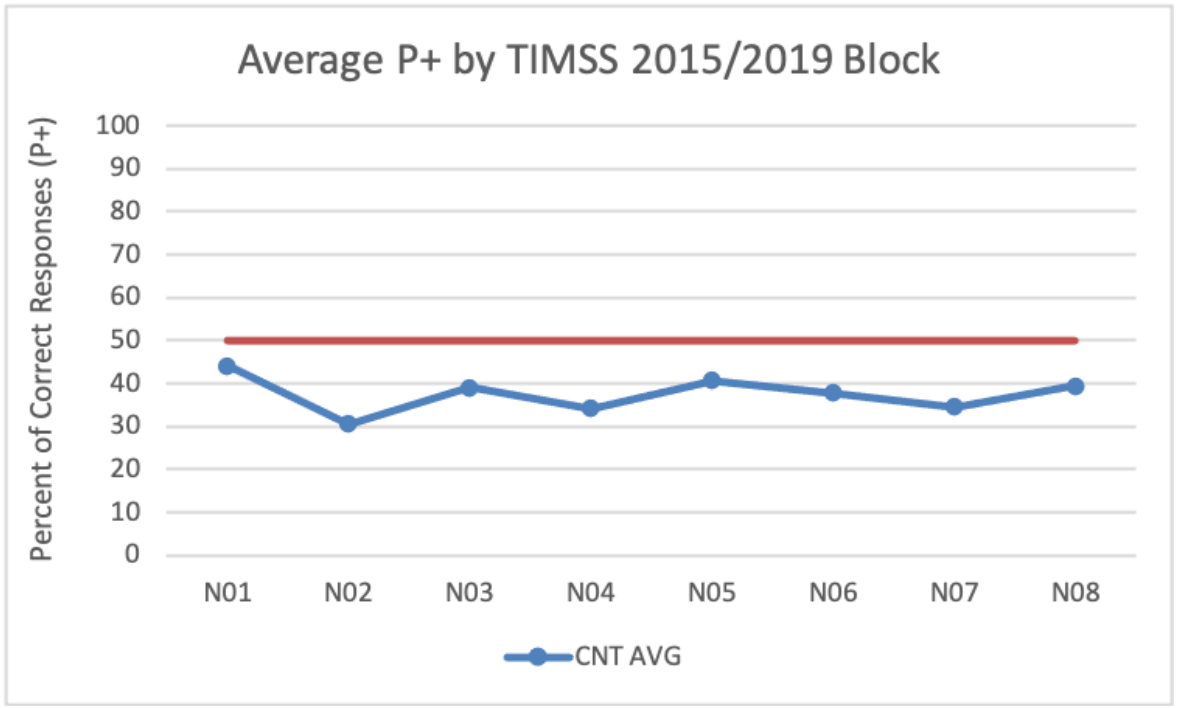
- Establishing a concordance between the ERCE/PASEC data and the TIMSS/PIRLS international scales/benchmarks requires the following Psychometric analysis step:
  - Establishing comparability through IRT scaling
  - Applying TIMSS/PIRLS item parameters to ERCE/PASEC data
  - Producing plausible values through population modeling
  - Validating and replicating the plausible values received in the ERCE/PASEC data sets
  - Building a concordance table based on derived plausible values

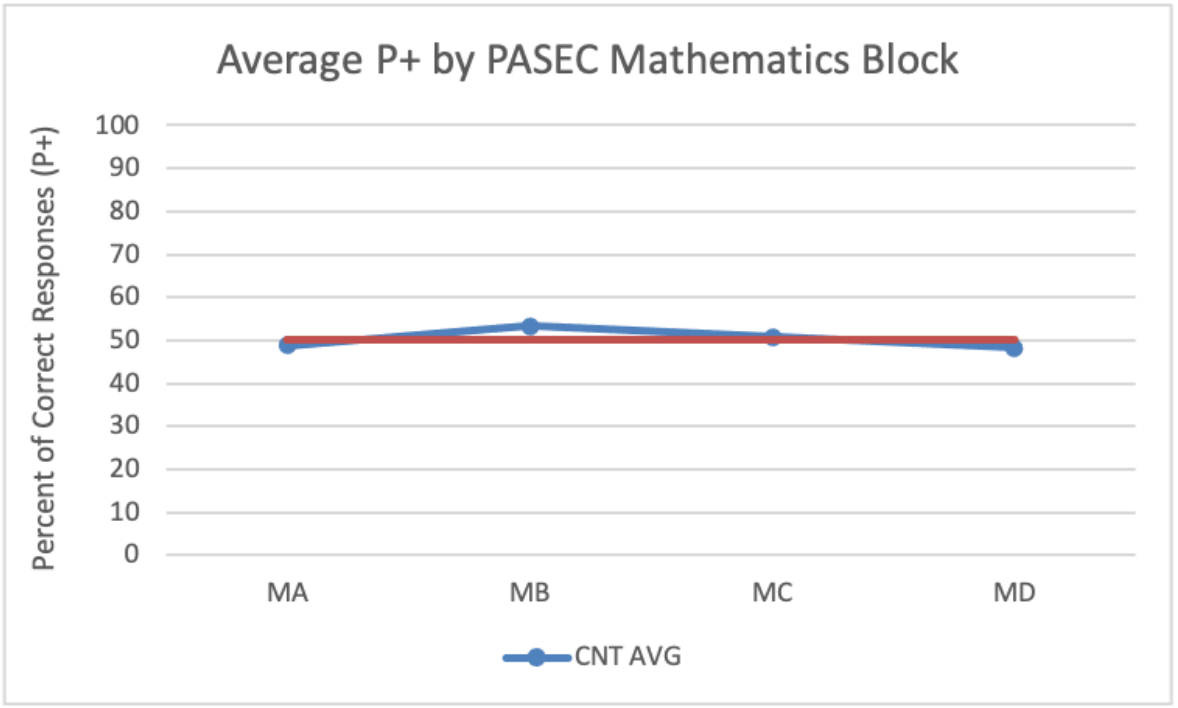


Rosetta Stone Project Status - PASEC

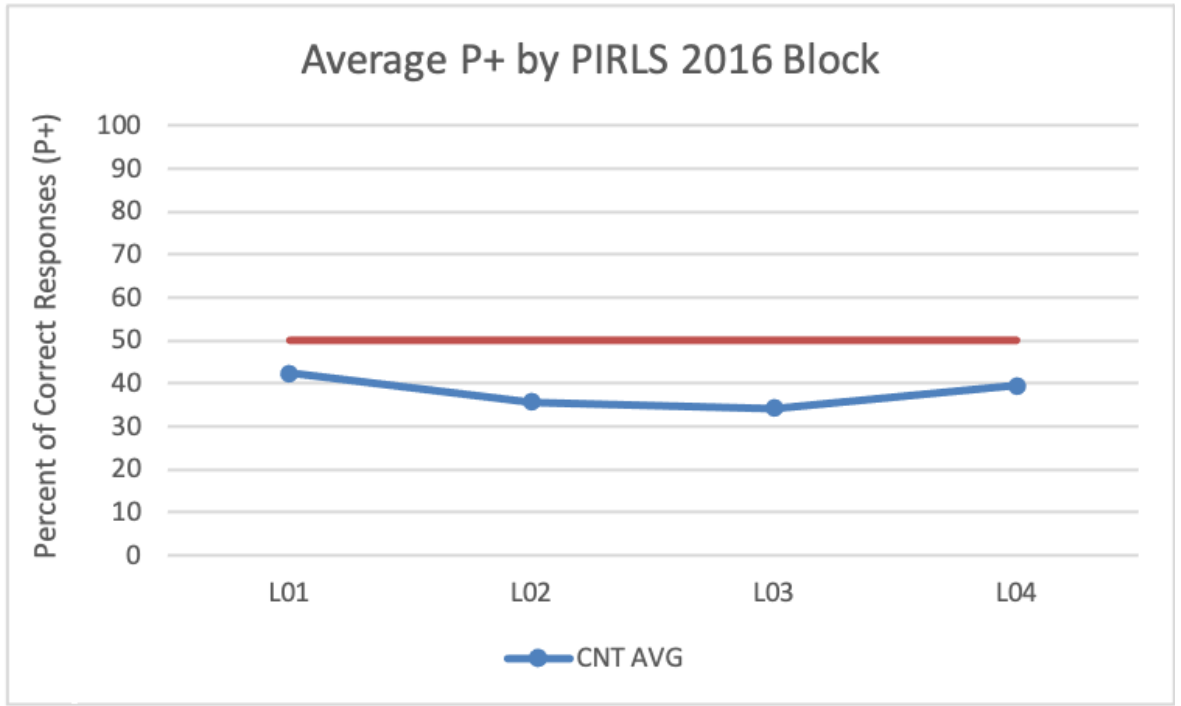
- Final data from Burundi, Guinea, and Senegal at TIMSS & PIRLS ISC, May 2021
  - Quality checks completed and almanacs produced, June 2021
- As expected, TIMSS and PIRLS item blocks are more difficult than PASEC Mathematics and Reading blocks
  - However, the difficulty level of the TIMSS and PIRLS items seems appropriate for Rosetta Stone analyses
- TIMSS and PIRLS item parameters show a good fit for the majority of link items
- Draft results of psychometric analyses presented to PASEC countries, September 23, 2021

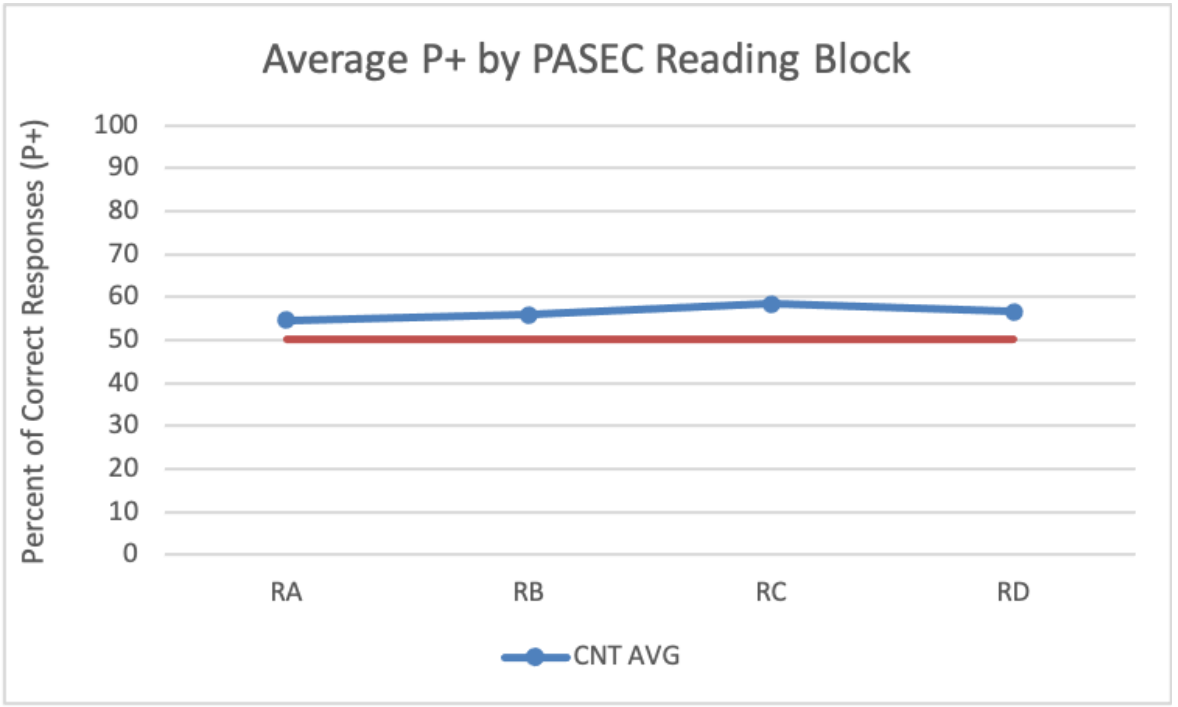
Average P+ by Item Block
TIMSS vs. PASEC Mathematics





Average P+ by Item Block
PIRLS vs. PASEC Reading





Rosetta Stone Status - ERCE

- Some delays due to COVID-19
- Classical item statistics and IRT scaling conducted on preliminary data
- Similar to PASEC, TIMSS and PIRLS items appear to be more difficult than ERCE Mathematics and Reading blocks
- Again, however, the difficulty level of the TIMSS and PIRLS blocks seems appropriate for the Rosetta Stone analyses
- Analysis will be finalized once the updated/final data files have been received

Reporting

- Concordance tables will be provided to translate between ERCE/PASEC and TIMSS/PIRLS achievement scales
  - Confidence intervals will be reported to account for measurement and linking error
- Using the concordance tables, it will be possible to
  - Estimate the expected TIMSS or PIRLS score corresponding to each ERCE/PASEC score
  - Determine the ERCE/PASEC scores corresponding to TIMSS/PIRLS International Benchmarks
  - Estimate the percent of students in each country that would have reached the TIMSS and PIRLS benchmarks
- Technical documentation of all results will be provided

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