Delivering remote learning using a low-tech solution: Evidence from an RCT in Bangladesh
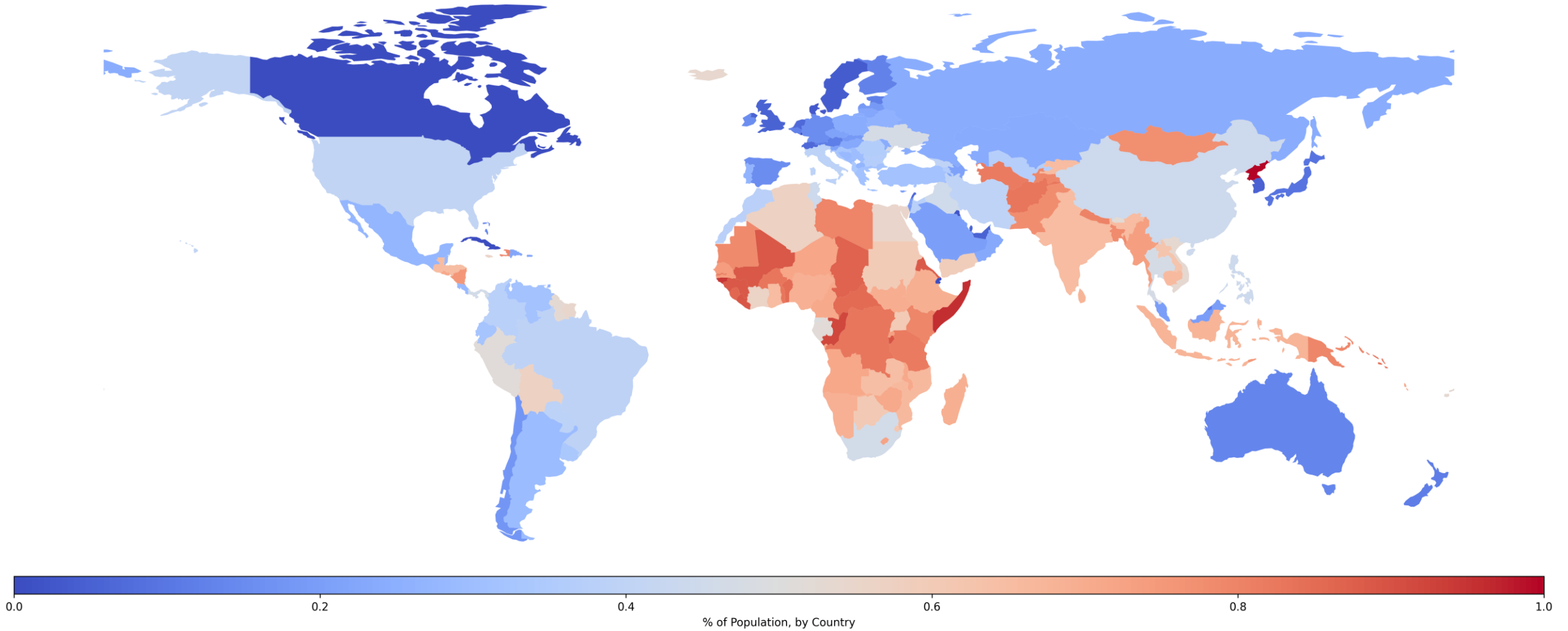
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Accessible remote learning

% of Population, by Country

1

Existing interventions (feature phones)

During the Covid-19 pandemic

- Feature phone -> educational purposes
  - one-to-one calls to students (Teletutoring / Telementoring / accountability checks)
  - one-to-one calls to caregivers
  - SMS to caregivers

However, these interventions –

- (calls) require significant manpower -> not scalable
- (calls) study hours -> not flexible
- (calls) resource sharing -> only one phone at the HH, multiple users
- (SMS) very limited scope; monitoring issues
- (both) network issues

Related papers: Hassan et al., (2021); Angrist et al., (2020); Crawfurd et al., (2021); Schueler and Rodriguez-Segura, (2021)

IVR-based Educational Intervention

15-week educational program

- IVR: IVR is an automated phone system technology that allows incoming callers to access information via a voice response system of **pre-recorded messages**.

- Lessons of **different proficiency levels** were recorded and stored in a telecom server.

- **Caregivers** could access these lessons **anytime** for free by calling from their **feature phones** and navigating them through IVR and listen lessons with **their child**.

- Three modules covered -> numeracy, literacy, and noncognitive skills; 30+30+15=**75 lessons**; each lesson -> **16 and 18 minutes**. (Link to content slide)

- **Pre-recorded conversations** among four characters: two teachers and two students. They interact among themselves -> clapping, standing up, counting, making plans, etc. -> listeners also follow those activities with their caregivers. [**Interactive Audio Instruction (IAI)**]

- Quiz after lesson; **Lottery (30hh/week)**; Homework.
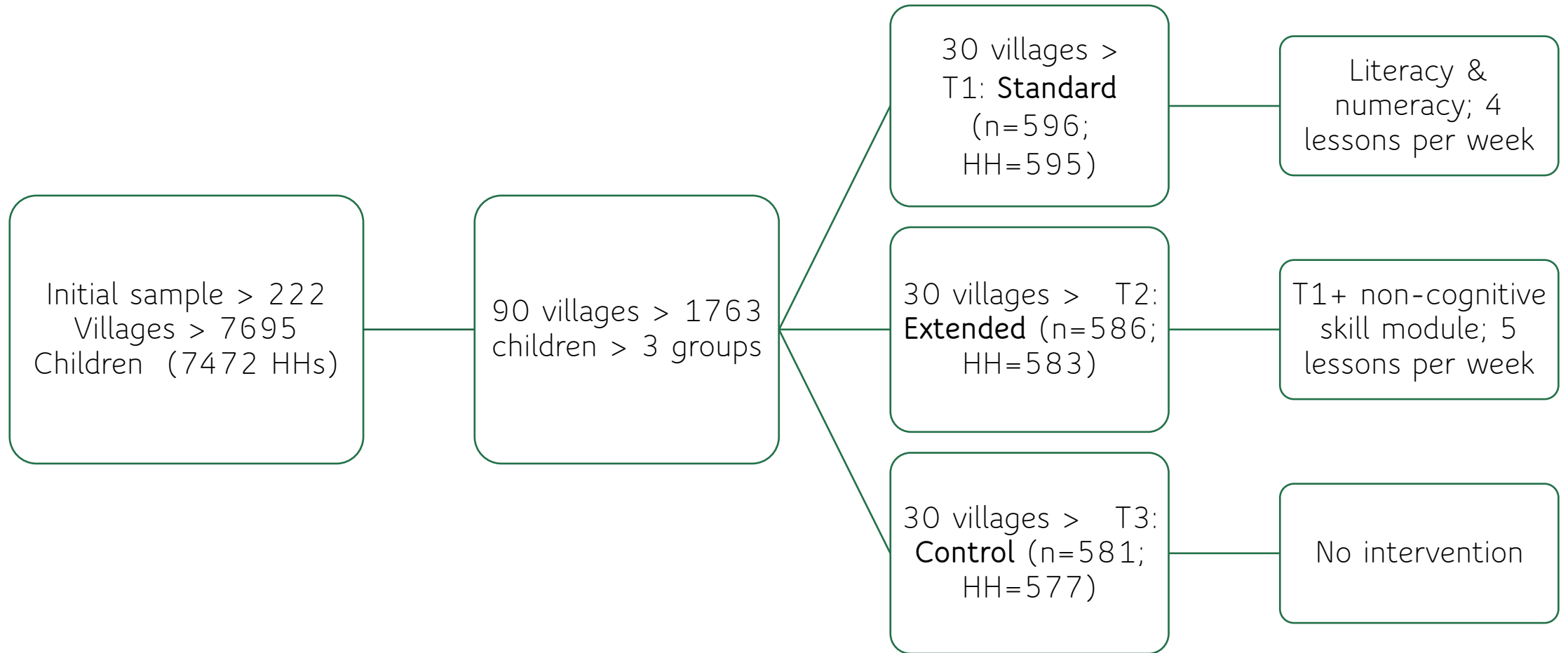
IVR Education - Timeline

Preparation	Baseline	Briefing	Intervention start — end	Endline
↓	↓	↓	↓ ↓	↓
Mar to May 21	May 21	Jun 21	Jun 21>> >>Oct 21	Nov 21
Content design; lesson recordings; IVR flow design & optimization; field test.	Baseline survey	Randomization; mothers' briefing	15-week intervention period	Children's assessment test; children's survey; parent's survey

Methodology

Initial sample > 222 Villages > 7695 Children (7472 HHs)

90 villages > 1763 children > 3 groups

30 villages > T1: **Standard** (n=596; HH=595)

Literacy & numeracy; 4 lessons per week

30 villages > T2: **Extended** (n=586; HH=583)

T1+ non-cognitive skill module; 5 lessons per week

30 villages > T3: **Control** (n=581; HH=577)

No intervention

Notes:
a. We capped the sample size at 22 children per village to match the budgetary allocation of this study.
b. We selected about 16-22 children per village. There are four villages with less than 16 children: 10 children each in 2 villages, 11 children in 1 village and 13 children in 1 village

Research questions and contributions

Research questions

- Does IAI-based education via IVR:

  - Improve the **cognitive ability** of primary school-age students and affect their **noncognitive skills**?

  - Improve **leadership**, **communication**, and **planning skills** of the children?

  - Reduce the **behavioural impact** of school closure among the students?

  - Affect caregivers' and students' **time investment** in **homeschooling**?

Key contributions

  - IVR-based IAI in household settings

  - First RCT

Notes:
a. There is another related study by Afoakwah et al., (2021). But there are some methodological issues.

Primary Outcome Variables

1. Children's cognitive ability

    - 80 marks one-on-one test; Numeracy & Literacy.

2. Children's noncognitive skills

    - Impulsivity

    - Grit

    - Growth mindset

    - Empathy

3. Leadership, Communication, and Planning [T2: Extended]

    - Renzulli scale

4. Behavioural Difficulties

    - Strengths and Difficulties Questionnaire (SDQ)

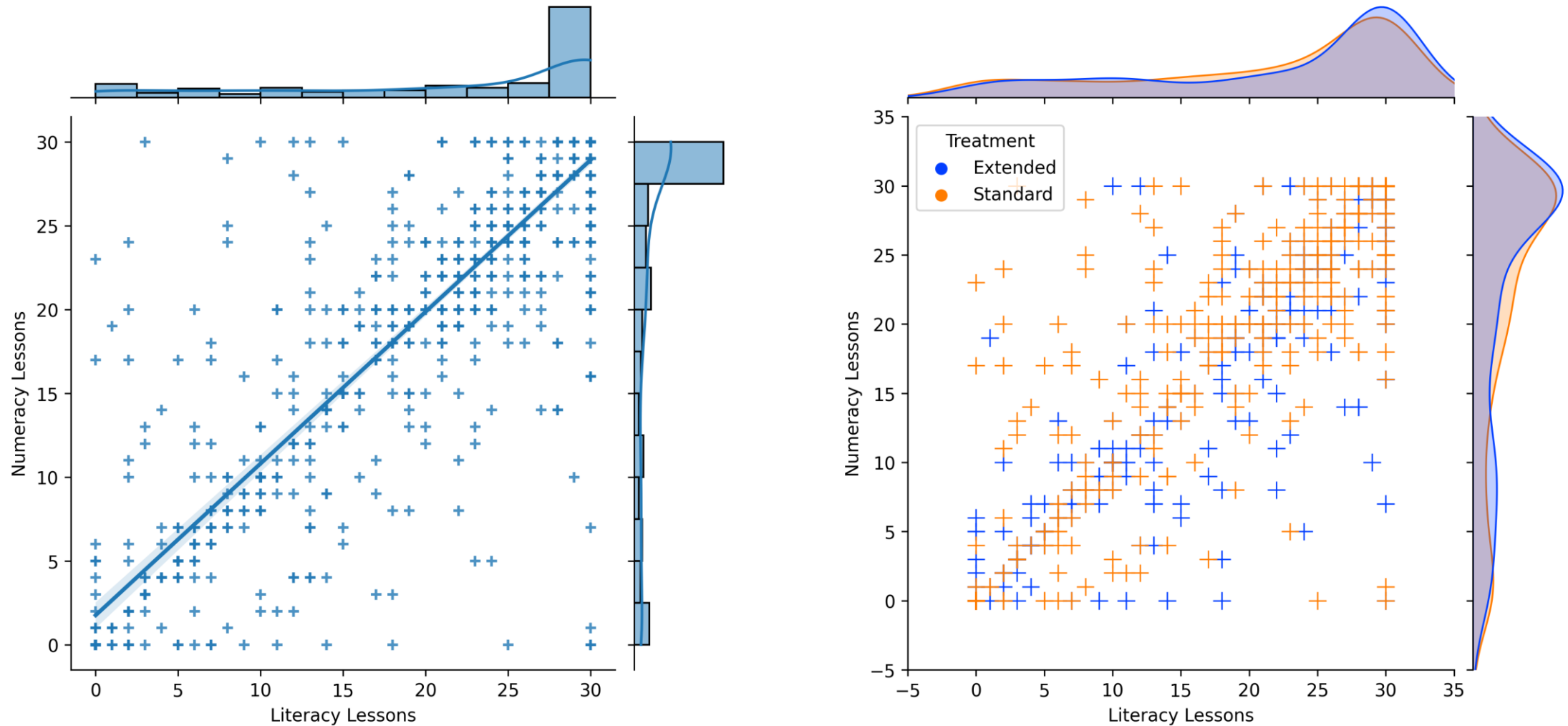# Secondary Outcome Variables

1. Homeschooling time (student)

   - Student's study time

   - Extent of study

2. Homeschooling time (caregiver)

   - Caregiver's time in home-schooling

   - Extent of caregiver's time
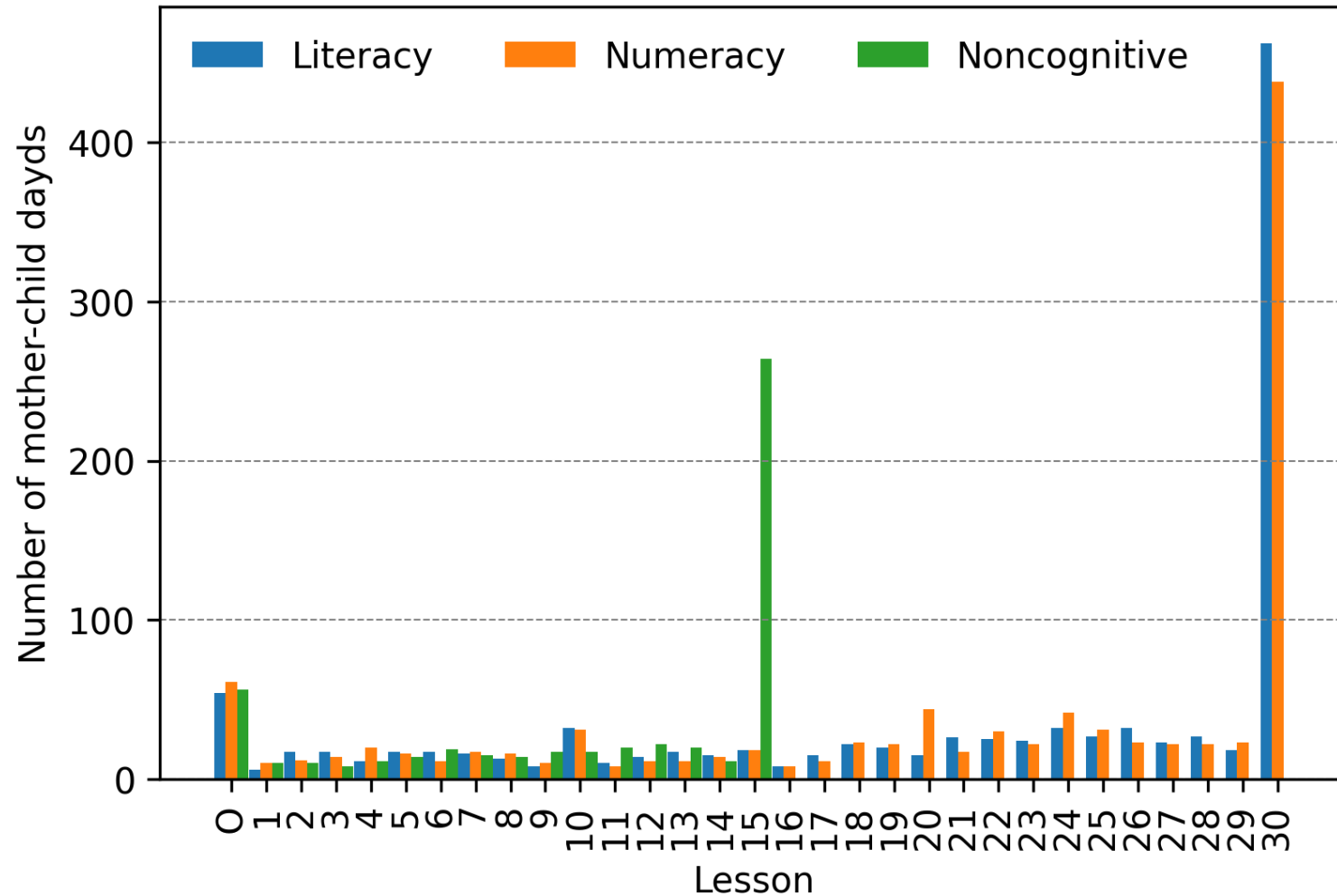
Figure 2: Lesson completed by caregiver-child dyads

Notes:
a. In our intervention, a total of 1,182 caregiver-child dyads received the treatment. However, a total of 1107 dyads fill-up the lesson attendance sheet. The rest of the 75 dyads didn't fill-up the form, therefore excluded from these charts.

Usage

Telco-Server statistics

- Total 8593.45 hours of lessons
- Each student listened to 7.27 hours of recorded lessons
- 43.6 minutes of listening per week (audio content was approximately 80 minutes per week).

Notes:
a. In our intervention, a total of 1,182 caregiver-child dyads received the treatment. However, a total of 1107 dyads fill-up the lesson attendance sheet. The rest of the 75 dyads didn't fill-up the form, therefore excluded from these charts.
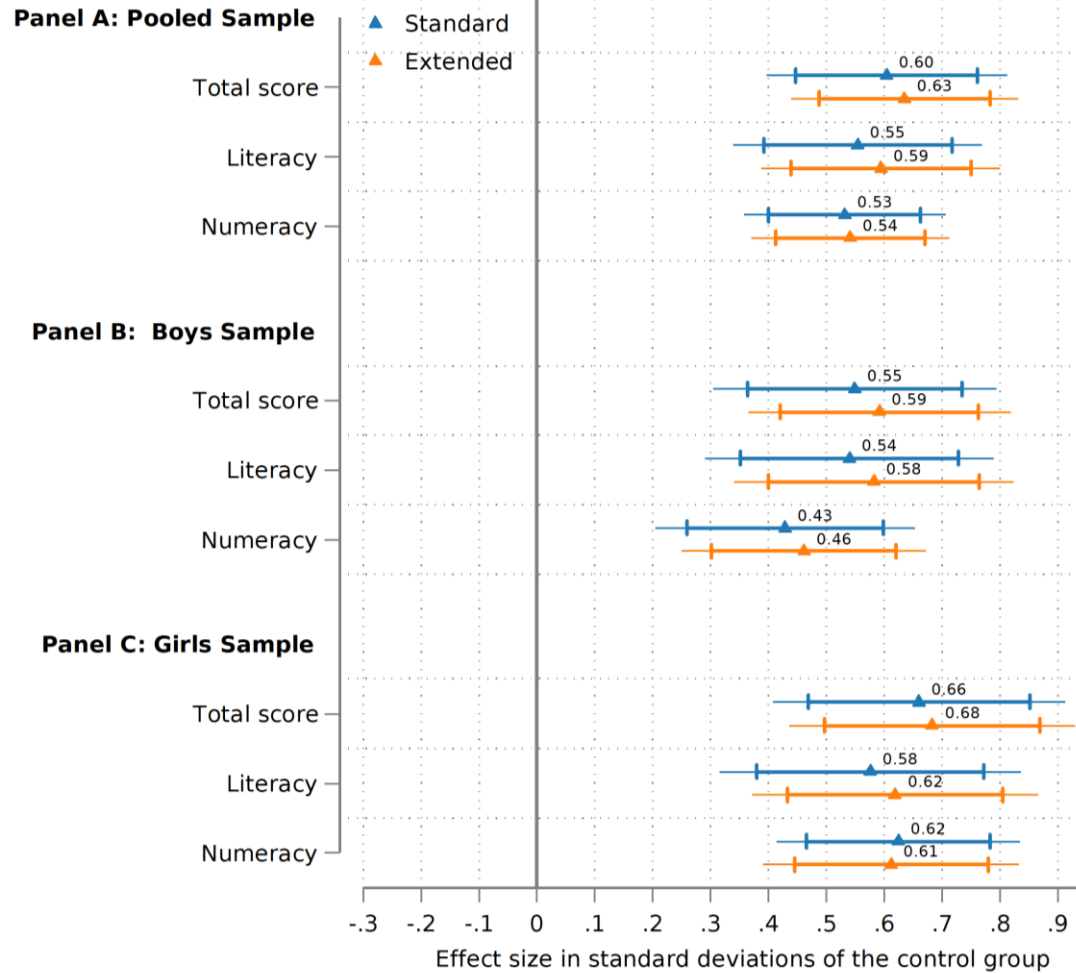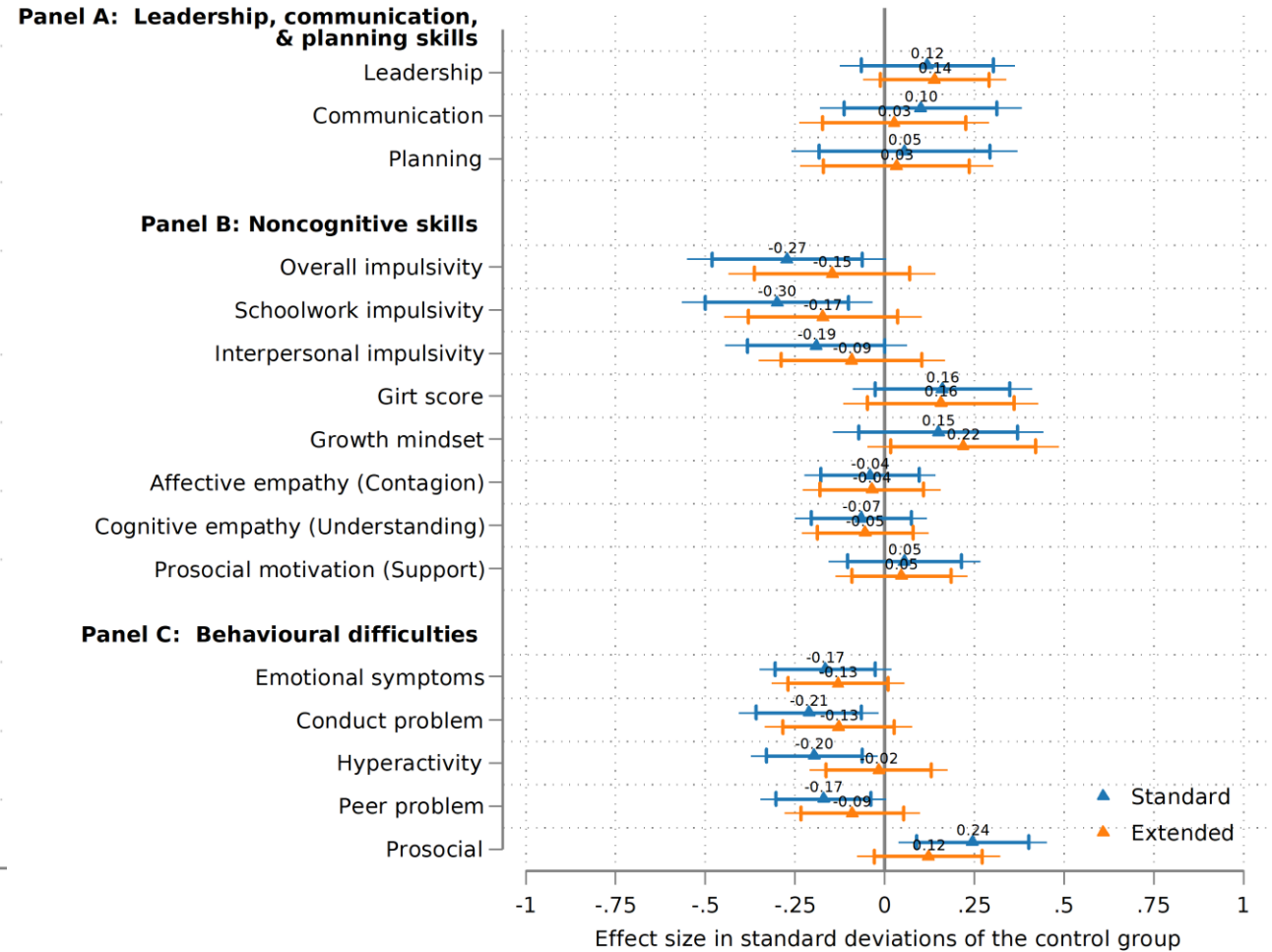
Treatment Effects

Fig4a: Learning outcome

Fig4b: Other outcomes

Secondary Outcomes and Robustness

Secondary outcomes

- Homeschooling time (student) -> no significant effect

- Homeschooling time (caregiver) -> Standard [0.20 SD (p<0.01)] and Extended [0.07 (p<0.05)]

Robustness

- Social desirability bias - the experimenter demand effect that can lead to over or underestimation of the treatment effect – No such evidence found.

- Assessment test reliability checks – Cronbach's Alpha, DIF - Robust.

Heterogenous Treatment Effects
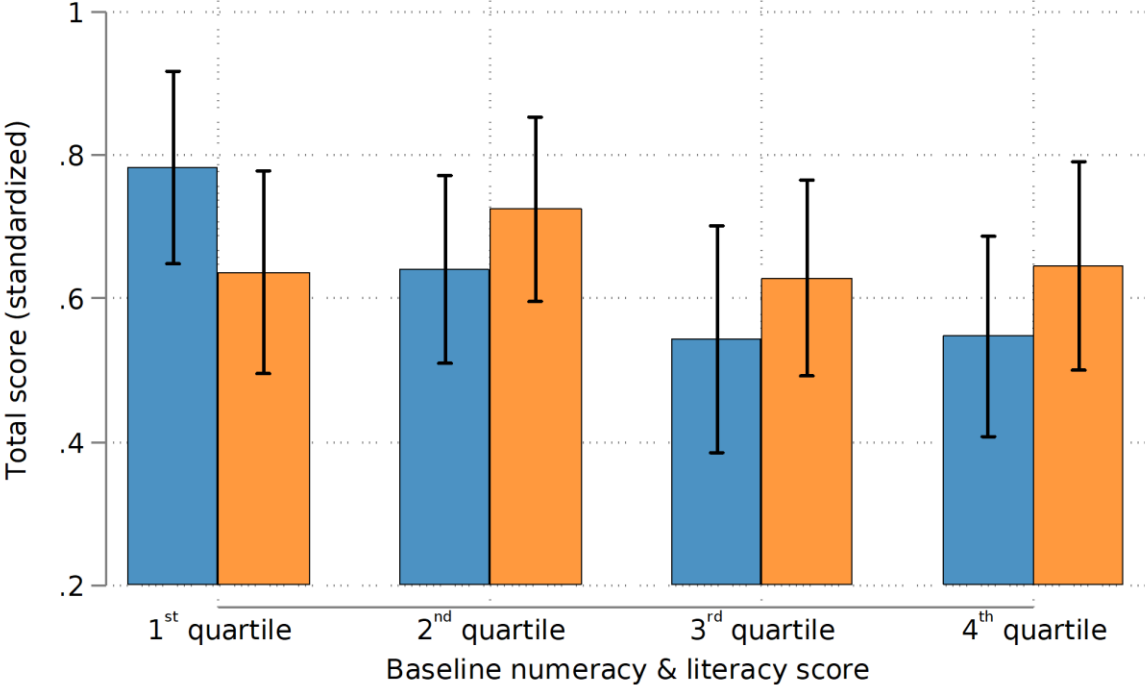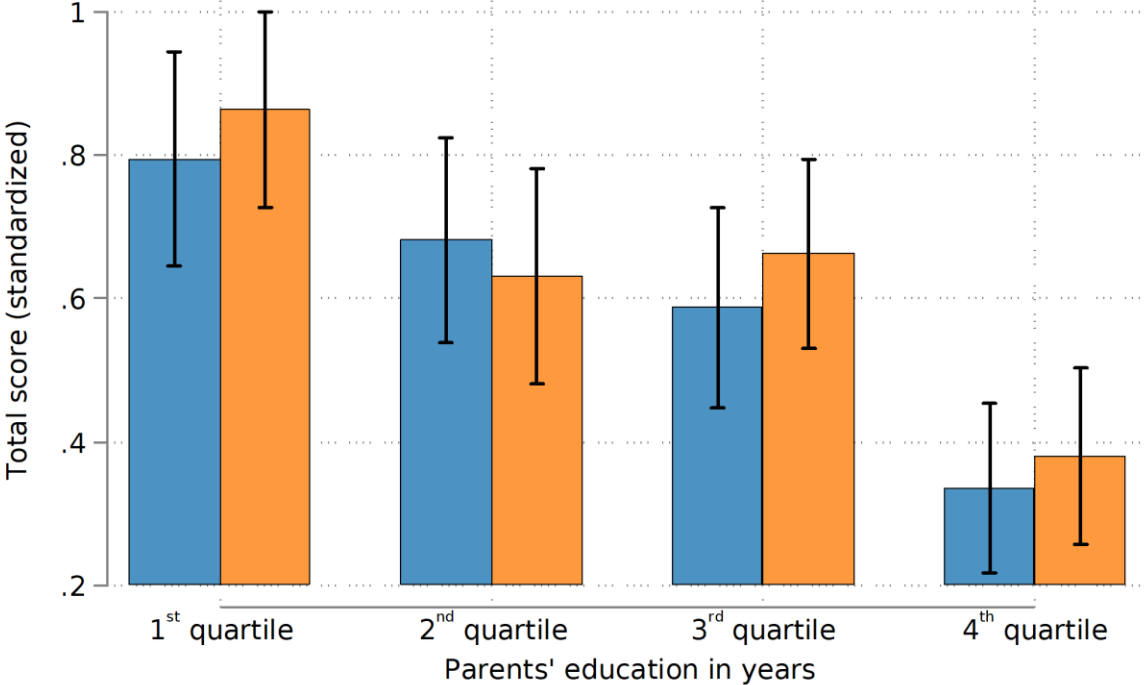

Fig5a: Baseline cognitive score
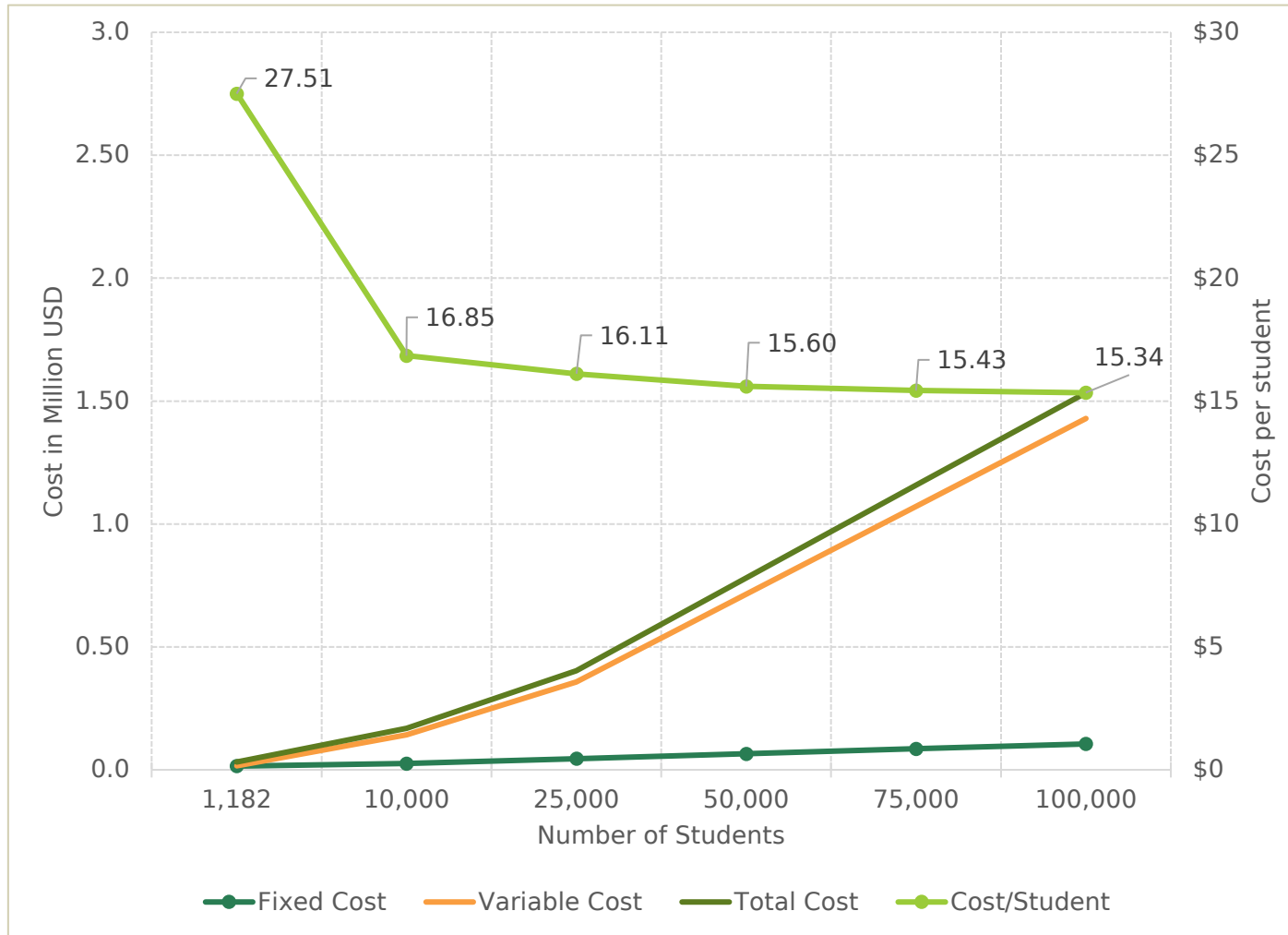
Fig5b: Parent's education

Scaling Up

Figure 6. Cost-volume analysis

A total cost of USD 15.3 per student for a 15-week educational intervention or USD 1.0 per week per student is not very cheap.

Scaling Up

Learning adjusted years of schooling

Variables	Equivalent Years of Schooling, e	Learning adjustment, L_i^h	Duration adjustment, t	LAYS	LAYS per $100
T1: Standard	2.70	0.64	0.34	0.59	2.14
T2: Extended	2.84	0.64	0.34	0.62	2.25

- LAYS 2.14-2.25 -> cost-effective
- Moreover, we intervened in the distance learning of children individually.
  - Flexibility
  - Learning at student's level -> personalised
- There is room for cost reduction if nationalised.

Thank You

Sample Balance and Survey Attrition

1. Programme vs. other children – 1763 Children (90 Village) vs 5932 Children (222 village)

- Balanced –> age, gender, father's age & education, mother's age & education, family income, HH asset, access to TV & radio.

2. Treatment arms at Baseline & Endline

- Balanced -> age, gender, baseline literacy & numeracy score, access to private tuition, father's & mother's education, HH member, family income, HH asset, access to TV, radio & smartphone, religion.

3. Survey attrition rate

|	T1: Standard		T2: Extended		T3: Control		Total	
	N	%	N	%	N	%	N	%
Not attrited	567	95.13	562	95.90	561	96.56	1690	95.86
Attrited	29	4.87	24	4.10	20	3.44	73	4.14
Total	596	100	586	100	581	100	1763	100

- Survey attritions are not different across the treatment arms [Chi-squared test: χ^2 = 1.5063, P = 0.47].
- No differential attrition evident [OLS regressions]

Lesson Contents

Table A1. Modules and content

Module	No of lessons	Contents	
Literacy (English)	22	Sentence structure, vocabulary, story.	Rising on Air + own team
Literacy (Bangla)	8	Vocabulary, synonyms, antonyms.	Own team
Numeracy	30	Counting, addition, subtraction, comparison, equation, forms of number, sorting.	Rising on Air + own team
Noncognitive skills	15	Leadership, qualities of a leader, active listening, communication & presenting, planning, bragging vs. humility, patience, empathy, sympathy & compassion, perseverance.	Lead Education + own team
Total lesson	75		

Assessment Test Score Distribution
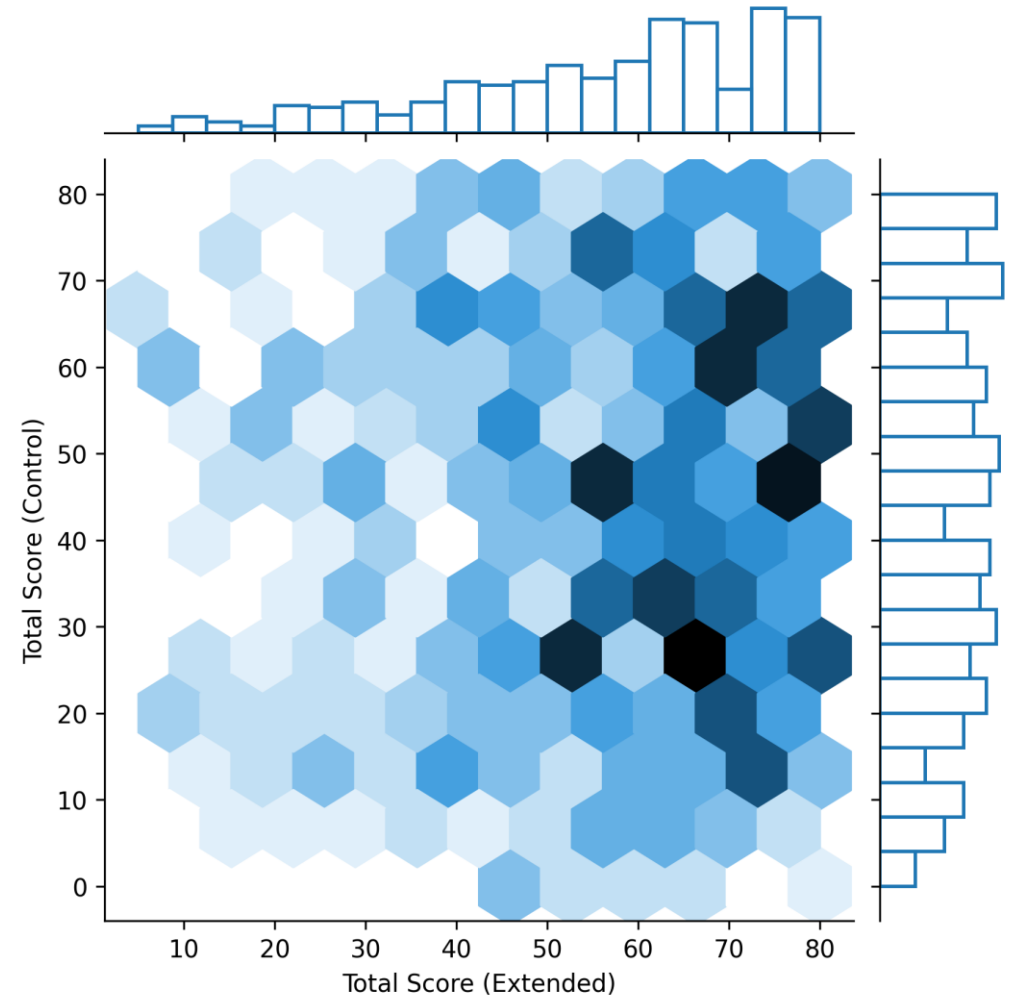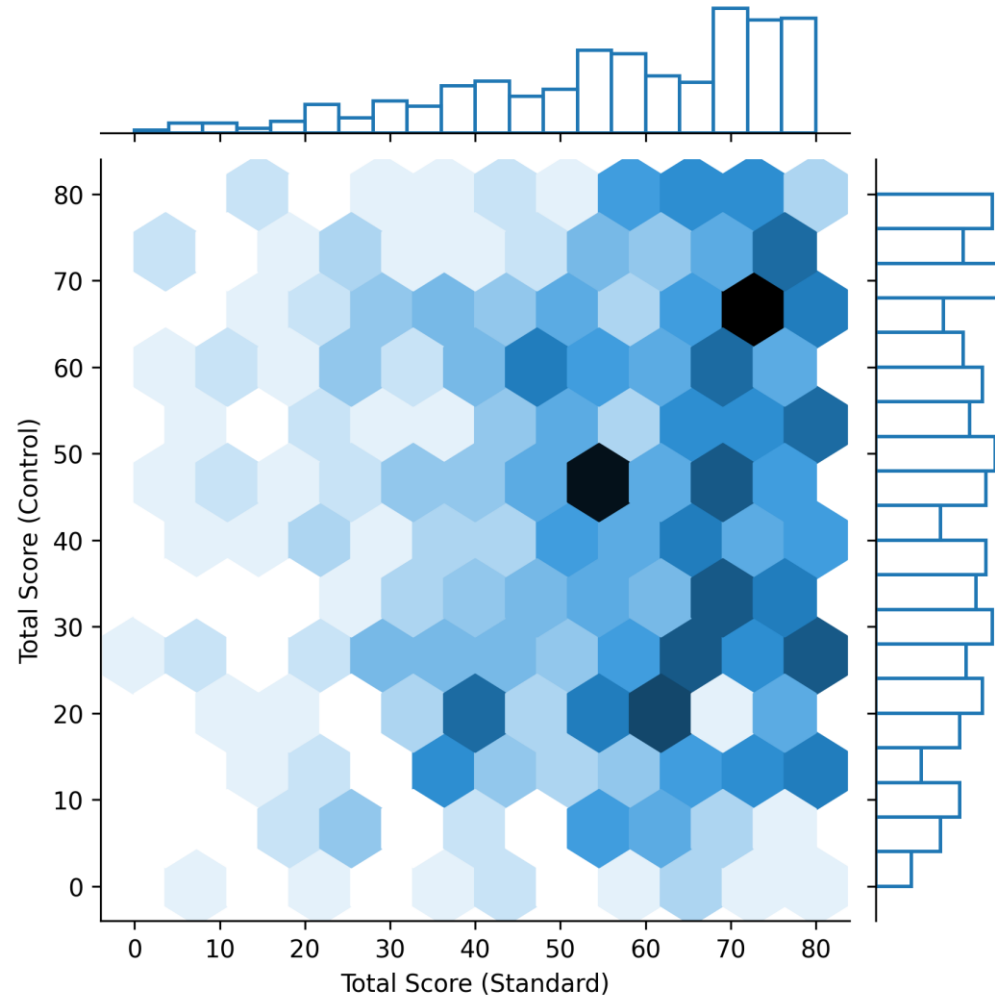
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