

Lowering Barriers to Remote Education: Experimental Impacts on Parental Responses and Learning

Emily Beam, Priya Mukherjee, Laia Navarro-Sola

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Motivation: Understand barriers to parental educational investments

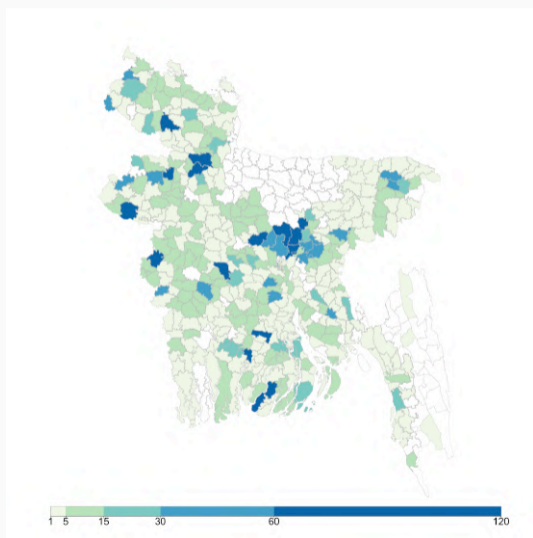
- Parental time and economic investments affect children's human capital development (Becker and Tomes, 1976; Cunha et al., 2006; Todd and Wolpin, 2007)
 - ▶ Barriers prevent investment optimization, educational interventions attempt to relieve different constraints
- Parents serve as intermediaries between policy and children's learning, re-optimize in response to policy changes (Das et al., 2013)
- Inequality in parental inputs lead to disparities in investments → can exacerbate educational inequality (Blanden et al., 2022)

Research question: How do parents adjust their investments in response to reduced barriers to remote education?

- How do parental responses differ by socioeconomic status?
- How do these policies affect persistent learning?

Our study: RCT in Bangladesh during Covid-19 school closures

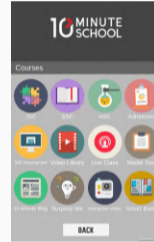
- 7,576 households of secondary school students across Bangladesh with smartphone access
- Three interventions (4-8 weeks) relieving different barriers to educational services take-up
- Two phone surveys to measure responses while the interventions were ongoing and persistence afterward



Experiment: 3 interventions to improve access to personalized learning

Duration: 4-8 weeks (Feb-April 2021)

(1) Information and reminders about the internet learning platform



10-minute school

Free app/website with videos and adaptive quizzing

▶ More

▶ Sangsad TV

▶ Full randomization

Experiment: 3 interventions to improve access to personalized learning

Duration: 4-8 weeks (Feb-April 2021)

(1) Information and reminders about the internet learning platform

(2) Information + Data subsidy



Data subsidy

1-month 10GB data package (untied)

► Sangsad TV

► Full randomization

Experiment: 3 interventions to improve access to personalized learning

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(1) Information and reminders about the internet learning platform

(2) Information + Data subsidy

(3) Individual teacher support



Teacher outreach

Weekly check-in calls from teacher

▶ Sangsad TV

▶ Full randomization

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Data collection through 3 remote surveys

September–October 2020: Recruitment and baseline survey

▶ Project timeline

March 2021: Parental survey while ongoing interventions, 68% response rate

- Parental time and economic investment in children's education
- Student learning activities, use of learning resources, time use (parent-reported)

June 2021: Survey 1–2 months after interventions end, 65% response rate

- Parental survey (same modules)
- Child survey: Learning assessment, engagement and aspirations

Descriptive statistics

- Two-thirds have TV with cable/satellite
- Wide distribution of parental education
- High rates of school work, private tutoring

▶ Sample balance

	Mean	Std.Dev.	Obs
Number of children	1.93	0.99	9027
Number of children grades 6-10	1.30	0.54	8908
HH has TV with cable/satellite	0.65	0.48	9038
Respondent is mother	0.50	0.50	9044
Respondent is father	0.50	0.50	9044
Mother completed primary	0.38	0.48	8227
Mother completed secondary	0.20	0.40	8227
Mother completed post-secondary	0.19	0.40	8227
Father completed primary	0.27	0.45	8397
Father completed secondary	0.18	0.38	8397
Father completed post-secondary	0.27	0.45	8397
Days of school work, last week	5.73	2.20	8758
Weekly days of school work, April 2020	5.63	1.85	8397
Received private tutoring since closures	0.59	0.49	8807
Child did work for pay, past 30 days	0.03	0.17	8802

Empirical specification

$$y_{hc} = \alpha + \underbrace{\beta_1 \text{AppInfo}_h + \beta_2 \text{GenInfo}_h}_{\text{Information Only}} \\ + \underbrace{\beta_3 \text{SubsidyAppInfo}_h + \beta_4 \text{SubsidyGenInfo}_h}_{\text{Information + Data Subsidy}} + \underbrace{\beta_5 \text{TeacherGenInfo}_h}_{\text{Teacher support}} \\ + \sum_{i=6}^9 \beta_j \text{InteracTreat}_{i,h} + X'_{hc} \gamma + f_s + g_w + h_j + \epsilon_{hc}$$

y_{hc} measured at *household-child* level. Includes pre-specified covariates (X_{hc}), FE (stratification-cell, f_s ; survey-week, g_w ; enumerator, h_j)

Full interactions to avoid bias (Muralidharan et al., 2021)

Report Anderson sharpened q-values for key outcomes.

Empirical specification

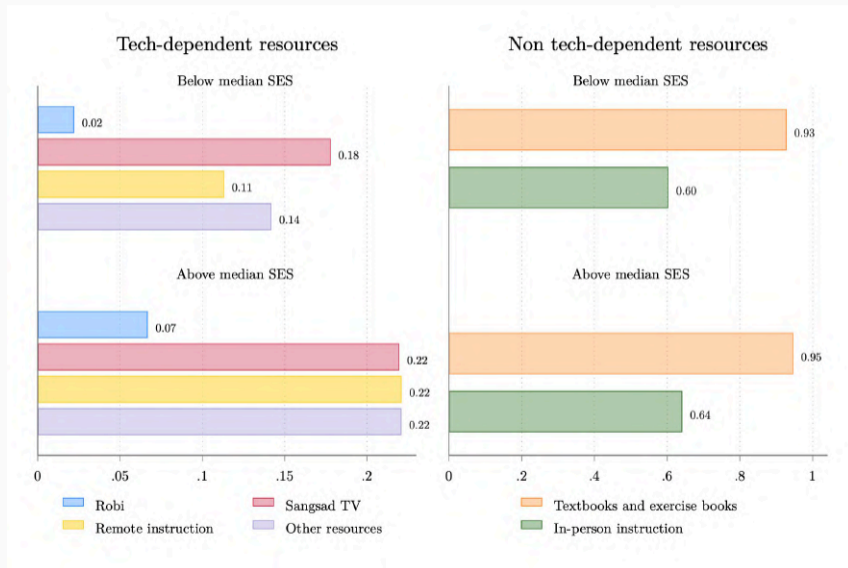
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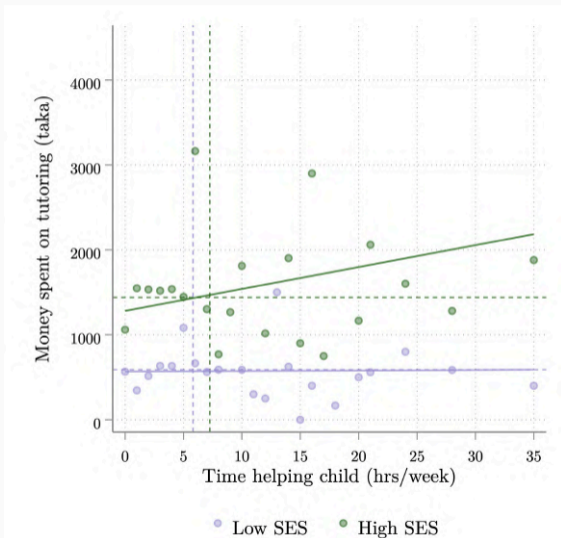
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Report Anderson sharpened q-values for key outcomes.

Differential use of tech learning resources hints to existing constraints



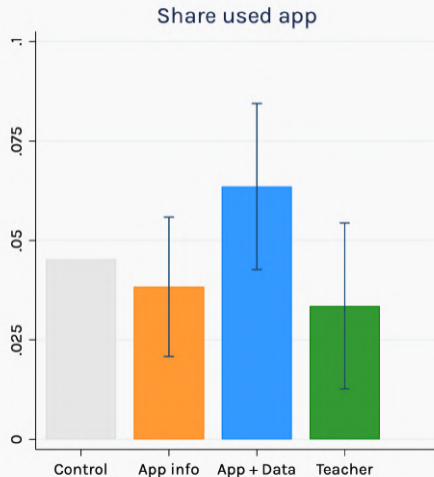
Parental time and monetary investment are (weakly) positively correlated



Extensive margin shift of use of specific learning resources

1. Only app info alongside subsidy increases its usage

- Info alone not sufficient
- App + subsidy \uparrow 1.8pp app use
 - ▶ 36% increase (low baseline)
 - ▶ \uparrow only among high-SES HHs (4.1pp vs 0pp)

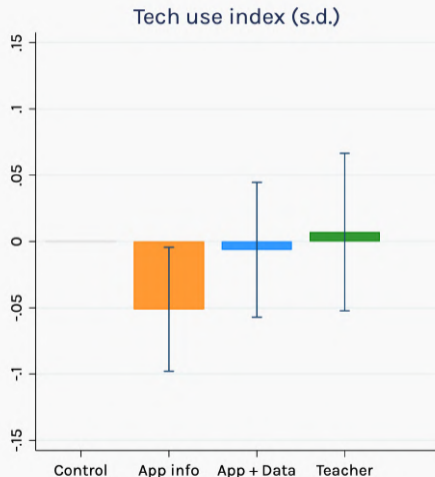


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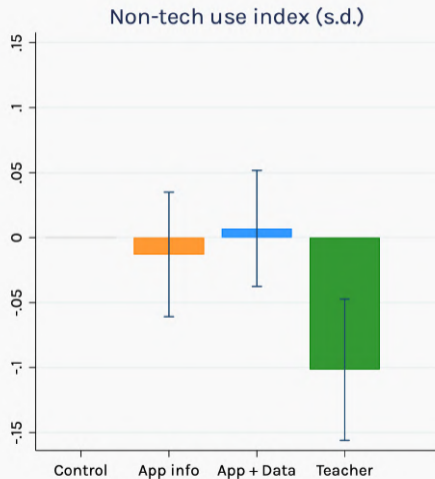
2. App info alone reduces use of tech

- App info \downarrow 0.051-SD in tech-learning resources use
- Other interventions do not affect net tech usage
- Intensive margin results similar



Extensive margin shift of use of specific learning resources

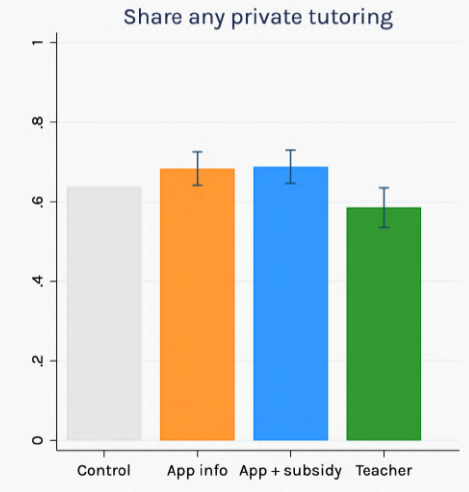
1. Only app info alongside subsidy increases its usage
2. App info alone reduces use of tech
- 3. Teacher support decreases the use of non-tech resources**
 - ↓ 0.1-SD non-tech resource use



Significant impacts on parental investments

1. Interventions affect parental educational investments

- App only \uparrow 4.5pp private tutor (7%)
- App + subsidy \uparrow 5.0pp private tutor (7%)
- Teacher support \downarrow likelihood of receiving private tutoring

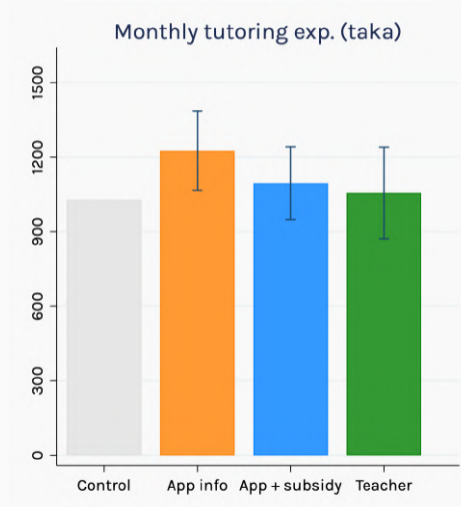


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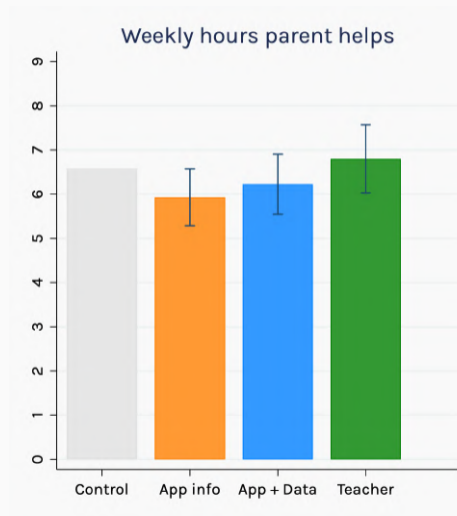
2. Data subsidy and info. attenuate parental responses

- App only ↑ 19% weekly tutoring expenses
- Subsidy mutes response
- No impact of teaching
- Wealthier HH increase tutoring only with info, poor HH with info + data



Significant impacts on parental investments

1. Interventions affect parental educational investments
2. Data subsidy and info. attenuate parental responses
- 3. When tutoring increases, parental hours fall**
 - Mostly driven by ↓22% of poor parents' time



Student outcomes: Measurement of student learning

- **Phone-based assessment:** 8/student aligned w/ grade-specific curriculum
 - ▶ Grade-specific base set of 4 questions (2020 grade level or lower)
 - ▶ Additional 4 higher/lower level questions
 - ▶ Substantial overlap across questionnaires, bank of 19
- Measures of student math knowledge
 - ▶ **Unadjusted score:** Standardized sum of 4 base questions
 - ▶ **IRT:** 2 parameter logistic model across all questions to estimate latent score

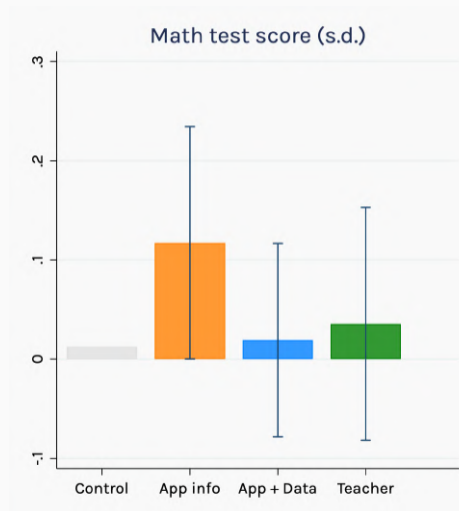
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Suggestive impacts of interventions on student math knowledge

- App information \uparrow 0.11 SD
 - ▶ \uparrow only among high-SES HHs (.205 vs. 0.001 s.d)
 - ▶ \rightarrow SES differences in \uparrow tutoring: Intensity or quality, additional barriers, different starting points?
- Data subsidy and info. no effect
- Teacher support no effect

\rightarrow Tutoring seem to cause \uparrow , not app



Conclusions and policy implications

1. Offering an educational service may lead to parents reoptimizing their educational investments even without adoption

- May act as a signal or nudge, and still have lasting effects on achievement
- Taking parental responses into account is key for results interpretation

2. Parents respond to policies by moving time and monetary investments

- Understanding private tutoring options, complementarity with other resources, and SES heterogeneities is key in certain contexts

3. Policies aimed at ↓ barriers may exacerbate educational inequalities

- Light-touch interventions ↑ learning of households with resources to respond to them

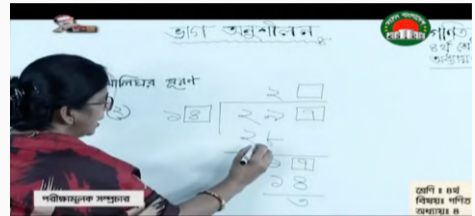
References

- Becker, G. S. and N. Tomes (1976). Child Endowments and the Quantity and Quality of Children. *Journal of Political Economy* 84(4), S143–S162.
- Blanden, J., M. Doepke, and J. Stuhler (2022). Educational inequality. Technical report, National Bureau of Economic Research.
- Cunha, F., J. J. Heckman, L. Lochner, and D. V. Masterov (2006). Chapter 12 Interpreting the Evidence on Life Cycle Skill Formation. In E. Hanushek and F. Welch (Eds.), *Handbook of the Economics of Education*, Volume 1, pp. 697–812. Elsevier.
- Das, J., S. Dercon, J. Habyarimana, P. Krishnan, K. Muralidharan, and V. Sundararaman (2013). School Inputs, Household Substitution, and Test Scores. *American Economic Journal: Applied Economics* 5(2), 29–57.

Todd, P. E. and K. I. Wolpin (2007). The Production of Cognitive Achievement in Children: Home, School, and Racial Test Score Gaps. *Journal of Human Capital* 1(1), 91-136.

Add'l arm: General info about educational TV platform

- Test whether salience of education drives information impacts

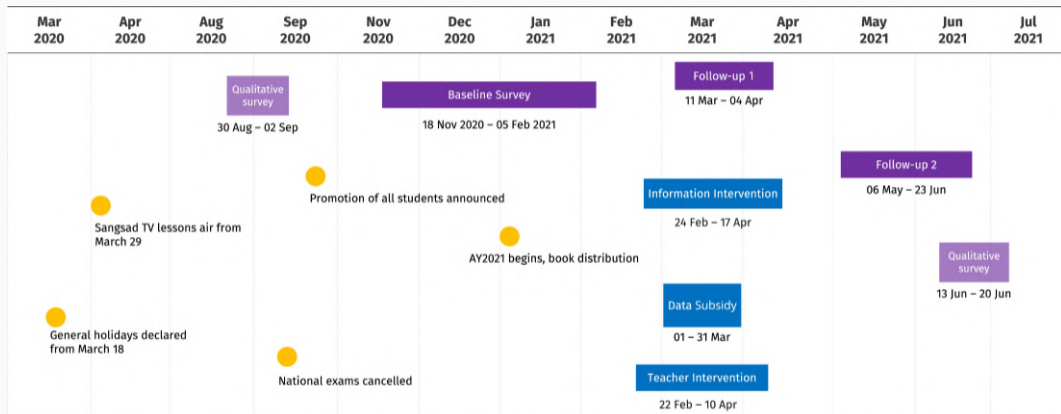


Sangsad TV

Government-broadcast recorded TV lessons (also available online)

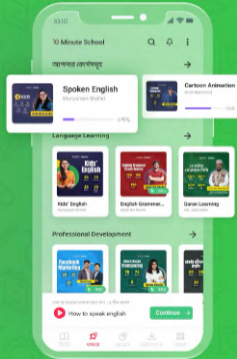
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Project timeline



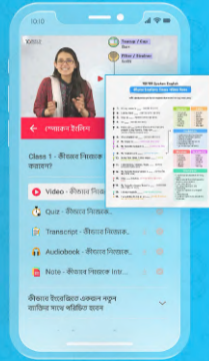
দক্ষতা উন্নয়ন

সর্বাধিক জনপ্রিয় স্কিল
ডেভেলপমেন্ট কোর্সসমূহ



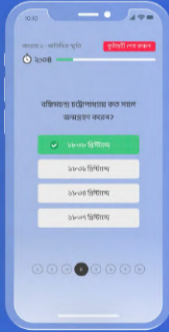
শিখন উপকরণ

টপিকভিত্তিক ভিডিও, কুইজ,
লেকচার শিট এবং লাইভ ক্লাস



কুইজ

টপিকভিত্তিক কুইজের
মাধ্যমে প্রস্তুতি যাচাই



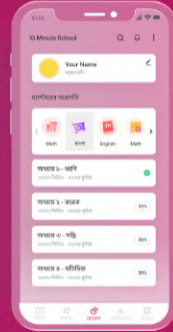
ফলাফল

পরীক্ষার সাথে সাথেই ফলাফল
এবং ব্যাখ্যাসহ উত্তর



প্রোগ্রেস

প্রতিটি বিষয়ের ফলাফল
বিশ্লেষণসহ পূর্ণাঙ্গ রিপোর্ট কার্ড



Randomization

N = 7,576	Information			
	None	General	Adaptive	General + Adaptive
No data	25% 1894	18.75% 1423	12.5% 947	12.5% 947
Data		6.25% 471	12.5% 947	12.5% 947

Teacher support

~44% within cells

Sample largely balanced across key covariates

	(1)	(2)	(3)	(4)	(5)	(6)
	All	Control	App info	Data + App info.	Teacher	Joint tests, all, p-val
HH size	1.92 (0.99)	1.91 (0.99)	1.96 (1.00)	1.90 (1.00)	1.92 (1.02)	0.845
Num. secondary children	1.30 (0.53)	1.27 (0.50)	1.32** (0.55)	1.29 (0.53)	1.30 (0.59)	0.469
Has cable/satellite TV	0.65 (0.48)	0.65 (0.48)	0.63 (0.48)	0.65 (0.48)	0.66 (0.47)	0.260
Mother present	0.49 (0.50)	0.50 (0.50)	0.48 (0.50)	0.51 (0.50)	0.49 (0.50)	0.790
Mother income	4864 (25390)	4550 (24830)	4492 (23506)	5921* (28666)	3394 (21705)	0.000***
Father income	51555 (134271)	51415 (134679)	52910 (138072)	51328 (132713)	50834 (130614)	0.726
School days/week, curr.	5.70 (2.23)	5.76 (2.17)	5.67 (2.26)	5.71 (2.21)	5.64 (2.29)	0.917
School days/week, Apr. 20	5.37 (2.16)	5.38 (2.18)	5.37 (2.14)	5.37 (2.16)	5.43 (2.12)	0.923
Has private tutor	0.59 (0.49)	0.58 (0.49)	0.60 (0.49)	0.59 (0.49)	0.60 (0.49)	0.818
Working for pay	0.03 (0.17)	0.03 (0.18)	0.03 (0.17)	0.03 (0.16)	0.02 (0.15)	0.622
Number of students	8771	2175	2219	2189	954	
Number of households	7576	1894	1891	1897	828	
Joint test, p-val			0.079*	0.612	0.465	

No evidence of differential attrition by treatment arm in March 2021 ($p = 0.15$), no difference relative to control group of key arms in June 2021, but reject overall equality ($p = 0.061$).