Behavioural Factors influencing Foundational Literacy and Numeracy Outcomes

Abstract

Foundation Literacy and numeracy (FLN) is critical for a child's education. NEP recommends a set of basic literacy and numeracy skills to be acquired by Grade 3. These requirements are not met in many districts in India for various reasons. Here, in a field experiment, we plan to remotely test an intervention targeted at parents by providing them simple activities to do with their children that improve math and Hindi skills. Activities are presented either through a WhatsApp group of parents; or by providing them with a workbook with similar activities.

Introduction

Foundational literacy and numeracy (FLN) levels in India are low and have declined further. The National Education Policy (2020) proposes a National Mission on Foundational Literacy and Numeracy (FLN) - prioritising an area that evidence suggests is critical for overall education outcomes. Studying global trends of learning outcomes and trajectories across years shows that learning shortfalls start early. Students who exit grade 3 without having acquired basic literacy and numeracy skills do not pick up these skills even by the end of primary school. The learning gap continues to widen from that point, as the texts in the language textbooks and mathematical concepts become more complex and abstract in later primary grades.

A policy typically introduces change by mandate and structural reform. However, policy adoption and sustainability rely on change from the bottom up - through changed attitudes, knowledge, and behaviours among the providers like teachers and the consumers, i.e., parents and the community. Behaviour science shows that people do not always behave rationally, even upon receiving training or information. They may be influenced by cognitive biases, not fully perceive choices available to them or be limited in their ability to convert intention to change into action. To drive sustainable change in a program, we should include behavioural elements that address individual biases, leverage social norms, build intrinsic and extrinsic motivations, and simplify the practice of desired behaviours.

Existing literature highlights that a behavioural lens is needed in education because various obstacles to change exist within the system. Our diagnostic findings below also corroborate these claims:
- Teachers believe that certain students cannot learn because of their circumstances (i.e., home environment or innate abilities of students)
- Teachers tend to externalise blame for low learning outcomes and attribute it to low parental availability and ability to support

- Teachers' comprehension of existing learning goals is low, and they believe that majority of their students are already at expected levels of learning.
- Teachers exhibit mindset barriers towards new pedagogical techniques: "I know how to teach."
- Value perception of early learning is low among parents
- Self-efficacy to provide home-based learning support is low among parents
- Parents have limited resources and time to support their children with learning at home
- Parents may not have the required knowledge to support institutional education, unlike teachers
- Parent-teacher interactions are ineffective due to social norms and weak structures

This project aims to test behaviour change strategies to improve foundational learning outcomes in Uttar Pradesh. The insights from these research experiments will aid in developing public goods by CSBC (Centre for Social and Behaviour Change) and CSF (Central Square Foundation) for States designing their foundational learning programs. The interventions designed and tested in this project will aim to improve behavioural outcomes for parents. Based on the insights from the diagnostic, we intend to focus on the below areas:

We aim to build agency & self-efficacy of **parents** in their role as consumers of education services. We propose that, while parents might be bad teachers, i.e., are not trained in pedagogical techniques nor are masters of the content covered in this critical period of education, they can still be good coaches. They have a vested interest in wanting their children to succeed. We leverage that to show them the role of parents in their child's education, emphasise how it is different from that of the teacher, and equip them with the resources they need for home-based FLN support and heuristics to assess the child's progress.

Indicators of interest:

- Increasing the parents' **time spent** on education-related activities with their children
- Increasing **salience of FLN goals** and education
- Increasing perception of **self-efficacy and confidence** among parents to engage in FLN
- Building **innovation** among parents to engage children even with limited resources & time

Based on our qualitative diagnosis, we designed interventions that we hypothesised would increase the adoption of home-based support for FLN learning. Our main objectives for the interventions are:

- Highlighting the role of parents as "coaches", and different from the role of teachers

- Making it easy for the parents to engage using fun and straightforward FLN related activities that we believe would increase confidence/agency among parents

- Use various behavioural nudges to make parents adhere to this daily FLN activity, such as reminders, motivational messages, commitment devices and report cards.

This document outlines a proposed experiment using the randomised controlled methodology to assess the effectiveness of the proposed interventions in increasing the parents' time spent with their children doing FLN related activities. It also includes other immediate outcomes, including knowledge and importance of FLN, self-efficacy and confidence among parents, and any impact on children's FLN skills.

Methods

Experimental Design Overview

Our design is a randomised control experiment. Parents of students from Grade 1 to 3 in government schools from the districts of Bahraich and Chitrakoot in Uttar Pradesh are eligible. Schools in each Block will be randomly assigned to control or treatment schools. Parents will be assigned to the Workbook or the WhatsApp group within each school based on their access to WhatsApp. The recruitment criteria and the treatment arms are explained in the following sections.

Recruitment will be followed by one in-person baseline survey that includes treatment initiation and a questionnaire to measure intentionality, value perception, confidence/ self-efficacy, knowledge, attitudes, past behaviour, and standard demographics. The treatment period will last seven weeks, followed by an endline survey.

Sample Identification

The study will be conducted in the districts of Bahraich, Chitrakoot and Balrampur of Uttar Pradesh. The pilot locations were chosen from the state of Uttar Pradesh because Mission Prerna, launched by Shri Yogi Adityanath in March 2020, aims to achieve foundational learning for all children in grades 1-5 by March 2022. All mission interventions are designed to ensure that at least 80 % of the students at each school and block will acquire foundational learning skills.
 These districts were selected based on the following factors:
1. Range of performance on the Aspirational Districts indicators of language and literacy in grades 3 (table given below)
2. Availability of support and the district's engagement with pedagogy and governance focused programmes

Based on this, the following three districts were selected: **Bahraich, Balrampur, and Chitrakoot.**

Aspirational Districts	Average Language Performance in Grade 3 (NAS)	Average Mathematics Performance in Grade 3 (NAS)	Grade 3 Language (ASER)	Grade 3 Maths (ASER)
Bahraich	70%	63%	31.4%	28.6%
Balrampur	72%	63%	22.3%	29.4%
Chandauli	65%	63%	52.5%	41.9%
Chitrakoot	68%	61%	36.3%	37.7%
Fatehpur	69%	61%	47.7%	45%

Shrawasti	47%	42%	21.5%	18.1%
Siddharthnagar	64%	57%	24.9%	31.7%
Sonbhadra	66%	55%	30.4%	22.4%

Three blocks per district were chosen in consultation with the district education administration and Piramal Foundation. All primary schools from these blocks were asked to share data on grade-wise enrolment and the number of parents with WhatsApp access. These blocks were selected based on operational feasibility for data collection, rural/urban representation, and perceived performance by district education officers (mix of high, medium, and low performing blocks). Once this data was collected from all schools in these blocks, CSBC was to select a subset of 20 schools around median total enrolment in that block in each of the three districts. Based on enrolment numbers and availability of smartphones with parents, one block per district was to be chosen. Due to a lack of timely response from Balrampur, it was dropped. An additional block from Bahraich was chosen instead. With inputs from the district education administration on accessibility, 17 schools per district from this subset were chosen for the study. 13 were chosen as primary schools, and four as backup schools. Parents of children in grades 1-3 of these schools will be invited for the baseline survey by teachers, and only those who provide consent will be selected to participate in the study.

Parents will be recruited for the study on a first-come, first-serve basis. Upon reaching the desired target for the control and treatment arms of the study, recruitment will be closed. If both parents of a child show interest in participating in the study, only one will be asked to volunteer for the study (the parent with time to engage with the child daily). If the number of parents showing up to the school is slow for the first half of the day, we will approach the teachers to contact the parents again to inform them about the study. CSBC will also sample some reserve/backup schools in each block if the selected schools are not enough to reach the target sample due to poor turnout.

Eligibility Criteria
- Sample must consist of parents with children currently enrolled in grades 1, 2 or 3 at a Hindi-medium government school.
- A subsample must have access to WhatsApp.

Treatment Components
Four
- **short Videos:** Parents are shown a set of videos that explain the FLN goals for grades 1-3, how children can be measured against FLN goals using simple heuristics on short, engaging, and accessible activities. These videos cover the role of parents as 'coaches' and being complementary to schools. They stress the importance of FLN and how a

child's FLN skills improve and thereby their future due to such parental contributions. Table 1 shows the details of all the videos.

- **T1:** Field Arm (Workbook) **FLN tasks:** Parents get a workbook with 40 FLN related tasks along with how to do these tasks. They are provided with a toll-free number to get an audio description of any task. The Workbook includes aspects to make the process more engaging and motivational (through messages), tick boxes to monitor the activities completed, commitment devices to increase adherence. Reminders will be sent to monitor the child's attendance and other school-related activities. Fig. 1 shows the different aspects of the Workbook in detail.
- **T1A:** Field Arm (Workbook) **IVRS calls:** Half the parents with workbooks also get IVRS calls every day explaining the activities, providing motivational messages and reminders. They also are provided with a toll-free number to get an audio description of any task.
- **T2:** WhatsApp arm **FLN tasks:** Parents get added to a WhatsApp group of their peers. They get five videos per week, each with a simple math or language task, motivation (through messages and report cards) and encouraging reminders, and a weekly report card. Parents can also ask any education-related questions. Reminders will be sent to monitor the child's attendance and other school-related activities in an assessment sheet. Figure 2 shows a report card template sent each week to the group to nudge parents to do more activities by applying social pressure.
- **T0:** Control arm: Reminders will be sent to monitor the child's attendance and other school-related activities logged in an assessment sheet. They will also be asked to note down the time spent with their child in education-related activities over a week and the nature of this time.

Table 1: A brief description of the Introductory videos common to all treatment arms.

Video	Description of Message	Duration
Video 1	The video introduces FLN and its importance and value to their child. Explains the FLN goals for Grade 3 through simple language narrated by a character who faces a familiar problem of lack of time, resources, and knowledge.	3 min 18 sec
Video 2	The same narrator explains how uses FLN activities to reinforce FLN skills and assess the children's progress. Introduces the overall intervention of doing one such activity a day in a short time.	2 min 52 sec
Video 3	The narrator's wife does two math activities with her son. We see her encouraging the child	4 min 35 sec

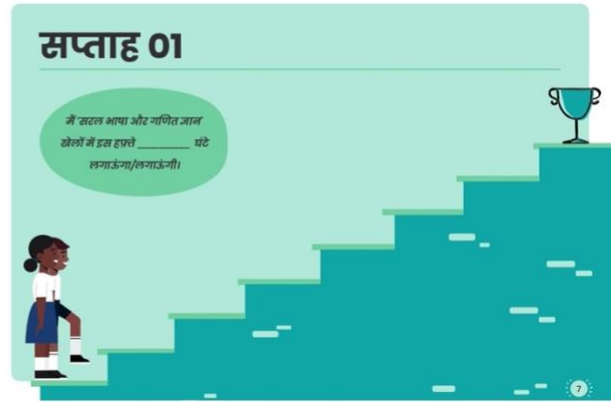| | and slowly increasing and decreasing the difficulty of the activities appropriately. | |
| Video 4 | The narrator does a Hindi activity with his son. We see him encouraging the child and slowly increasing and decreasing the difficulty of the activities appropriately. | 3 min 55 sec |

Figure1: The Figure shows four pages from the Workbook. A. It is a calendar page to track when each activity is done. B. Page at the beginning of the week includes a commitment device to declare how many hours the parent will spend that week doing FLN activities and a staircase to show progress. C. An activity page that shows a simple Hindi activity and a heuristic for parents to assess their child when doing the activity. It also shows the toll-free that can be called to get an audio recording of the instructions. D. Page at the end of the week to monitor school-based activities as well as a motivational message. The trophy celebrates the achievement of completing another week.

Figure 2: Shows a template of the report card. The number of stars next to each parent's name corresponds to the number of activities completed that week.

Experimental/ Survey Design

The BL and EL surveys will be conducted via an in-person setup, with on-ground enumerators administering the survey on tablets. Introduction to the intervention - including screening of introductory videos, discussion of intervention and distribution of workbook/addition to WhatsApp group will happen in-person on the day of the baseline. The rest of the intervention will be administered to the treatment groups via WhatsApp and Workbooks. All participants will be compensated in kind with a set of pens worth Rs. 100 each for both baseline and Endline surveys.

The participants of the workbook group engage with the Workbook and its various facets - the tasks, call to get task descriptions, messages and stickers for motivation and acknowledging achievement, and calendars and tick boxes and commitment devices to create a habit of this engagement. They are encouraged to maintain a ledger of the FLN tasks completed and how well the child could do each task. They will also be asked to monitor their child's school-related activities and report every week. Half the participants will also get IVRS calls, and this group has an additional component of getting a daily reminder to do the activities.

The subjects in the WhatsApp group will interact on WhatsApp by sending photographs and videos of their children doing the tasks. They can ask task-related questions. They will be given motivational messages, encouraging reminders, feedback through report cards to help sustain the momentum and continue to engage with these tasks. They will also be asked to monitor their child's school-related activities and report every week.

This evaluation will have the following components:
- **Student Outcomes:** *Teachers administer the same standardised test of math and Hindi to all students of grades 1-3*
- **Baseline:** *This will be conducted by enumerators in person with tablets.*

- **Treatment:** *Will include four videos showed directly after Baseline (For the Whatsapp group, they will also be sent on WhatsApp) explaining FLN and ways for parents to contribute to their child's FLN learning, sent on the first week.*
    - **Treatment A:** *A workbook with all the tasks is given to the participants. They are expected to complete the tasks one each day. Each task has a toll-free number to get an audio description of the task.*
    - **Treatment A1:** *the audio recording for each activity will be converted to an IVRS call and sent to parents every evening, along with other messages and reminders. They will still have access to the toll-free number to make calls independently.*
    - **Treatment B:** *During the second to seventh week, five texts will be sent each week outlining the FLN tasks, along with other messages and reminders.*
    - **Control:** *The monitoring of school-based activities will be shared across all treatment groups and the control group.*
- **Student Outcomes:** *Teachers administer the same standardised test of math and Hindi to all students of grades 1-3 (same as baseline)*
- **Endline**: *This will be conducted in the same format as the baseline.*

Randomisation

We use a clustered randomisation method. We randomly select 13 schools around the median total enrolment at the Block level. The schools could refuse to participate due to election duty load, lack of bandwidth, etc. Other schools will replace them. We randomise schools into control schools (13, 4-5/block) and treatment schools (26, 9/block). We have 13 clusters (schools) per arm. Parents without WhatsApp are part of the field control within the control schools, and parents with WhatsApp are part of the WhatsApp control. Parents without WhatsApp are part of the field/Workbook intervention within the treatment schools, and parents with WhatsApp are part of the WhatsApp intervention. 50% of the Workbook group will get IVRS calls within each school, and the other 50% will not get these calls. While we ensure we have parents with and without WhatsApp in the control group, we do not separate them into two groups.

Data Collection

Enumerators from the Maitra agency were hired to administer the in-person baseline survey on licensed software, Qualtrics on their offline app. Parents are invited to participate in the study by the teachers. They are asked to gather on the school premises on a specific day. Enumerators conduct the surveys in-person and type the answers into the app (on their tablets) simultaneously. The interview itself will not be recorded. The duration of the survey is around 60 mins. They will be compensated for their time in kind—a set of pens worth Rs. One hundred will be given, along with refreshments. Only complete surveys will be used for analysis, and no participants with partial surveys are recontacted to resume the survey. While the enumerators are familiar with the broad outline of the study, they are not made aware of the details of the treatment groups to reduce potential bias. The enumerators introducing the intervention

aspects are different from those administering the baseline survey. The survey and interventions are in Hindi. The endline survey will happen in the same manner.

Experimental Flow

Step 1: Hindi-medium government schools are selected based on their median enrolment rate in a given block and asked if they are willing to participate, i.e., recruit parents for both baseline and endline and conduct student tests at baseline and endline. If they refuse to participate, they will be replaced with other schools.

Step 2: Selected schools will be randomised to control and treatment schools.

Step3: Teachers help collect contact information of eligible parents with children in grades 1-3 and identify the subset with access to WhatsApp. (See Randomisation plan above). They ensure the attendance of parents at baseline and endline surveys by inviting them to the school premises on specific days.

Step 4: Teachers conduct a student evaluation based on standardised tests (prepared by us). These evaluation sheets will be collected during baseline.

Step 5: Baseline through in-person surveys: Enumerators hired through an external agency conduct surveys and mark answers on Qualtrics offline app on tablets. The same standard consent question is asked to all participants during this process.

Step 6: Deployment of treatment - FLN related videos are shown to all the treatment participants immediately after the surveys. These are not shown to control. The Control group receives only monitoring sheets to note down attendance and other school-based activities between baseline and endline surveys. They will get weekly IVRS reminders about the same.

Step 7: Deployment of treatment (A) - Workbook with FLN tasks, behaviourally informed reminders, motivational messages, commitment devices are given to parents without access to WhatsApp; immediately after the videos are shown. They go through a brief session on using the Workbook and call a toll-free number for task descriptions.

Step 7: Deployment of treatment (A1) - Workbook with FLN tasks additionally get an IVRS call every day with an audio task description of that day's activity.

Step 7: Deployment of treatment (B) - Participants with access to WhatsApp are added to WhatsApp groups immediately after the tasks. They go through a brief session on using the WhatsApp groups and what to expect from it. The videos they saw will also be sent to the groups by the end of the day. They get FLN tasks, behaviourally informed reminders, motivational messages, feedback, and answering any queries will all take place in these groups.

Step 8: Teachers conduct the same student evaluation again. These evaluation sheets will be collected during the endline.

Step 9: Endline administered through in-person surveys. Enumerators hired through an external agency conduct Qualtrics surveys on tablets.

Pilot data

The entire questionnaire will be tested in 6 schools, 2 per group. The same enumerators will collect this pilot data to ensure the data quality and address any concerns faced in the field.

Backcheck

10% of the participants will be chosen for an additional short survey across treatment and control groups and enumerators. A week after the primary data collection, these surveys will be conducted by a separate set of enumerators via a phone call. It will include a few questions about the previous survey length and comfort rating, their intention to spend time on their child's education, a few knowledge, and demographics questions.

Sample Size Determination

Based on the literature and experimental work conducted with similar research goals and study population, the sample size for the current study was determined by conducting the following power calculations:

Power	0.80		
Alpha	0.05		
	Case 1	**Case 2**	**Case 3**
Benchmark study used	Field RCT in San Francisco, USA testing the effectiveness of text-based interventions with parents[1]	An 18-week field experiment in Chicago, USA, testing the efficacy of personalised text messages (goal-setting, planning prompts, feedback, information) targeted towards parent expectations in increasing attendance in subsidised preschools[2]	Field RCT in Los Angeles, USA, where Biweekly information was provided to parents on their child's missed assignments for six months. Focussed on Negative feedback[3]
Assumption: Effect Size	N = 558 Outcome: Parents engaging in activities Control vs Treatment; Increase in parental	N = 741 Outcome: Increase in school attendance via official school records Control vs Treatment; an increase of .15 SD	N = 180 Outcome: Parents taking away the child's TV privileges etc. based on the report

	engagement in literacy activities by 26% of a SD (p<0.05) compared to the control group		card in the treatment was 1.660 (0.718)
Estimated required sample size	188-229 PW per treatment arm

Total: ~564-687 parents (assuming two treatment arms and one control) | 551-699 parents per treatment arm

Total: ~2097-1653 parents (assuming two treatment arms and one control) | 418-530 parents per treatment arm

Total: ~ 1254-1594 parents (assuming 2 treatment arms and 1 control) |

Based on the power analyses above and other studies, we selected a sample size of 300 per arm. This sample size is also in line with previous studies done by CSF in the education field in rural UP (n=350). With a sample of 300 per group, and a 0.8 power, 13 schools per arm, we will be able to detect an effect size of ~0.5, accounting for an ICC as high as 0.15. With a lower ICC of around 0.03, we can detect an effect size of ~0.3. If we were not clustering control and treatment schools, we would be able to detect an effect of ~0.23.

Outcome Variables

We primarily want to test if providing the parents with a.) Explanation of their role in their children's education, specifically FLN and its importance b.) Simple and engaging FLN activities and heuristics to assess children's progress will increase their engagement with their child's education, both in terms of home-based FLN learning support and monitoring of school-based activities. Additionally, we investigate whether we increase knowledge and salience of FLN, change confidence/agency of parents to contribute to their child's education, and whether the effect of treatment changes as a function of the amount of hyperbolic discounting exhibited by the parents at baseline.

See Table 2 for a description of all outcome variables and how the outcome measure is created for each construct.

Table 2: Description of primary variables

Outcome Variable	Description[1]	Outcome Measure

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[1] Please refer to the survey instrument for further details on all outcome measures across tables.

Knowledge of FLN goals: To gauge the child's level in terms of **reading/language skills and math skills**. These levels will follow Soochi and Lakshya goals for grades 1-3, without a distinction between the grades[2].	Direct questions regarding what FLN includes and a gradation of those skills, ability to recognise letters, read small words, sentences at a certain speed, and then faster. One digit addition, two-digit addition, two-digit subtraction.	The number of correct responses across four questions. Variable type: Numerical (0-4)
The salience of FLN learning: To estimate the importance given to FLN by the parents	**Self-reported** measures using Likert scale rating of likelihood (1-5): **Rate the importance** of -**education**, **FLN**, **good teachers**, and **parental involvement**.	Number with Likert-scale response '3' and above for the scale questions Variable Type: Numerical (0, 1, 2, 3, 4)
Intention to contribute to their child's FLN learning	**Self-reported** measures using Likert scale rating of likelihood (1-5): **Rate your intention to** contribute to your child's FLN learning.	Number with Likert-scale response '3' and above for the scale question Variable Type: Binary (0, 1)
Sense of agency/ valuation of FLN	**Valuation Game:** A game where parents make a series of choices always between "spending 30 mins learning more FLN activities to engage with their child" or receiving an endowment y, where the endowment amount will gradually reduce from Rs. 200 to Rs. 1. To make it a realistic choice, for 1% of parents, this will be enforced – a price is randomly chosen and	5 Steps (INR 200, 150, 100, 50, 1) Variable type: Numerical (1-5)

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[2]; due to many classes being a multi-grade classroom - thus, the distinction between grades will not be a part of this study.

	based on their choice at that price, they have to spend 30mins learning FLN activities at the end of the survey or get the price amount.	
Specific Confidence	Ten scenarios/vignettes of a parent/child interaction and asking about the parents' next step. Options are 1 FLN activity and three non-FLN activities. E.g., Payal saw a poster in the newspaper at home and was able to read words like 'aaj', 'sham', 'lal' ('today', 'evening', 'red') taught in school, out loud. As Payal's parent would you: -Teach her more complex words, like 'apraadhi', 'charcha', 'Khabar' ('culprit', 'discussion', 'information') etc. -Tell her to read her Hindi book. -Congratulate her on learning well and playing cricket with her. -Teach her to identify similar small words made of the same letters. [FLN choice] In each case, participants answer and state how confident they are of that answer using the Likert scale rating of likelihood (1-5).	- Number of correct responses across ten questions. Variable type: Numerical (0-10) - Mode of confidence rating. Variable type: Numerical (0-10) - Bias: Difference between average subjective confidence estimates and objective accuracy Bias = $\Sigma(c_i - a_i)/10$ [*direction* and *magnitude*]. From +1 to -1. High (> zero) and low (< zero) scores, indicative of poor confidence calibration, are described as over and under confidence, respectively. - Discrimination: the difference between average confidence assigned to correct and incorrect items $$D = \frac{\frac{\sum c_{correct}}{p} - \frac{\sum c_{incorrect}}{q}}{\sigma}$$ [*metacognitive ability*]
General Confidence	**General Confidence measures** are three general tasks administered on a tablet to measure general confidence. Both accuracies of the task and confidence (Likert scale rating from 1-5) in each answer is measured. • Visual Memory task - A grid of 16 objects is shown for 2 mins, followed by 32 images, 20 old and 20 new.	The number of correct responses across questions in each task. Variable type: Numerical (0-20) or (0-32) - Mode of confidence rating. Variable type: Numerical (0-20) or (0-32) - Bias: Difference between average subjective confidence estimates and objective accuracy Bias = $\Sigma(c_i - a_i)/10$ [*direction* and *magnitude*]. From +1 to -1. High (> zero) and low (< zero) scores, indicative of poor confidence

	Participants answer if the image was seen before and how confident they are of their answer for each image. • Vocabulary test - A word and four options are shown below. The enumerator reads out the word and the options and asks which options are closest in meaning to the target word. The enumerator enters the answer and the confidence rating for a total of 20 items. • Esoteric Analogies Test - The test contains 20 items of the following type: CHICK is to HEN as CALF is to: BULL, COW, COAT, ELEPHANT (answer = COW). The enumerator reads out the words and enters the answer and confidence rating.	calibration, are described as over and under confidence, respectively. - Discrimination: the difference between average confidence assigned to correct and incorrect items $$D = \frac{\frac{\sum c_{correct}}{p} - \frac{\sum c_{incorrect}}{q}}{\sigma}$$ [*metacognitive ability*]
Hyperbolic discounting: To estimate the amount of discounting bias parent exhibits. We will further examine the treatment effect as a function of discounting at baseline.	A standard discounting question is asked using a **convex budget task**. Participants answer a question where choosing a payout later ensures an overall greater payout. -Rs.75 this week & Rs. 0 in 3 weeks -Rs.50 this week & Rs. 50 in 3 weeks -Rs.25 this week & Rs. 100 in 3 weeks -Rs.0 this week & Rs. 150 in 3 weeks To ensure the parents play realistically, they are entered in a	

	lottery. If they win the lottery, they are given the option they choose.	
Specific Discounting: At Endline, we will measure FLN related discounting with a lab-in-the-field discounting	An FLN related **lab-in-the-field game** would be played at Endline, which estimates the number of times, FLN related actions are picked in a series of choices where the choice leads to a **delayed but larger reward**. The alternate leads to an **immediate but smaller reward**. The number of FLN choices (choosing FLN even though the reward is delayed) between treatment and control will be compared. We also have non-FLN choices with delayed reward as a comparison (like pay for medical insurance); these choices may be the same between treatment and control.	Number of FLN delayed choices across the task. Variable type: Numerical (0-10) The number of non-FLN delayed choices across the task. Variable type: Numerical (0-10)
State their belief in their child's math and Hindi abilities.	Rate whether the child's math and Hindi abilities are above, same, or below for his age.	Number with response 'same' or 'above' for the questions Variable Type: Numerical (0, 1, 2)
Primary Outcome Measure FLN/Education engagement: Parent's involvement in their child's education	Self-reported measures of how much **time** they spend with their child and the different roles they fulfil (the one in grade 1-3 currently). As well as how involved they are in the school in terms of frequency of meeting the teachers[3].	The time they spent in a week with the child. Ordinal variable (1-5). Roles fulfilled by parents. Categorical variable (1-5). Frequency of Parent-Teacher Meetings based on the number conducted. Ordinal variable (1-7). The action that is taken when the child is falling behind. Categorical variable (1-5).

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[3] An additional question asking the role of parents (not specific to them) will be used for qualitative analysis.

School-based Engagement:	Weekly monitoring of child's attendance, homework assigned, homework completed, test score (if any), time spent in the past week on FLN activities (more generally education-related activities for control).	An index of child's school performance across seven weeks of monitoring – Continuous variable An index of consistent monitoring by parents – Numerical variable (1-35)
Student Outcomes: Hindi and English test scores	Teachers will administer an FLN evaluation on all students (control and treatment) both at baseline and Endline using a standardised test at Grade 1 level. The same test will be given at both baseline and Endline.	An index of child's performance combined across the two tests – Continuous variable
Demographics:	Age and Gender of the parent. Highest education level and employment of both parents. Household Income, number of people in the house, Religion and Caste. Whether the child is going to tuition/other people are helping.	Age – Continuous numeric variable. Gender – Binary Variable. Education – Ordinal variable (1-9) Employment – Binary variable The logarithm of household income per person – Variable Type: Continuous Religion and Caste combined – Variable Type: Categorical variable (1-9) The child has other help – Binary variable
Treatment Validation and within treatment group outcome measures:	1. WhatsApp group: Home-based engagement measures through photographs/videos of the child doing the FLN activity sent on WhatsApp each week. Parents can also ask questions/raise concerns regarding the tasks or any other aspect of their child's education, which will indicate their level of engagement with the	Treatment Received or not – Binary variable (1 = more than half the activities completed and assessed)

| | treatment. Parents are encouraged to maintain an assessment sheet to note down the child's score for each activity.
2. Workbook group: Parents are encouraged to tick every activity done with the child and how well the child can complete each task within the Workbook. This monitoring will help them assess and monitor their child's progress. The number of entries will consistently indicate the parents' ability to assess and monitor the children; to be evaluated at Endline. | |

Model Specifications

Ordered Logistic Regression will be used for ordinal outcomes (2 FLN/Education engagement measures) and logit regression for the categorical variables (2 FLN/Education engagement measures).

Ordinary Least Squares will be used for discrete and continuous numerical variables (Knowledge, Salience, Intention, Valuation of FLN, Specific Confidence (bias), General Confidence (bias), Belief in their child's ability, Child's school-based engagement, Monitoring of School-based Engagement, Student test outcome).

We will use one model controlling for demographic information and measuring the increase from baseline measures (M1) for every outcome measure. M1 is repeated for each of the three treatment groups.

Ordinary Least Squares will be used for the discrete numerical variable of specific discounting, modelled without baseline measure (M2).

Fourteen primary outcome measures and three treatments make 42 hypothesis tests. Thus, we will use multiple hypothesis testing adjustments with pFDR and the q-value[4].

M1: Y ~ treatment_assignment + demographic_covariates + baseline_measures + error

M2: Y ~ treatment_assignment + demographic_covariates + error

Y = outcome measures in Table 2

treatment_assignment = dummy variable, 1 for treatment and 0 for control.

Further, we will split the sample into high discounting and low discounting groups based on the median discounting value. We will estimate if the treatment effect differs for the high and low discounting groups in each of the three groups using a T-Test. We will also use multiple hypothesis testing adjustments with pFDR and the q-value.

All analysis, including randomisation and data checks, will be conducted using custom-made MATLAB (The MathWorks, Inc) scripts in R (R Core Team, 2014)[5].

Randomisation Check

Treatment status is the only difference between the treatment and control groups in a randomised control study. On average, all other characteristics of treatment and control group members, including demographics, should be balanced. Treatment effect estimates could be biased if there is an imbalance across the groups despite the randomisation process. We will check for balance between treatment and control groups for baseline measures.

M3: X ~ treatment_assignment + error
X is the different Outcome measures of interest at baseline.

Attrition Check

The biggest concern with attrition is the possibility of bias. If the types of treatment group parents who attritted are systematically different from the control parents in a manner related to our outcomes, results are likely biased. For example, if poorer parents leave one treatment group more than the control group, and income correlates with study outcomes, results are likely skewed upward. We would analyse by regressing a binary variable that equals one if a parent attritted on treatment status,

(3) A ~ treatment_assignment + X_i + treatment_assignment* X_i + error

 A is a binary variable of attrited or not.
X_i is the different Outcome measures of interest at baseline.

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