Intergenerational Transmission of Pro-Environmental Attitudes and Behaviors*

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Abstract

This study investigates the spillover effects of an environmental education program on non-participants, specifically the transmission of pro-environmental behaviors between children and parents. Through a randomized field experiment involving 1,545 child-parent pairs in Patna, India, we examine whether program participation increases environmental knowledge, efficacy, and behaviors. Our experimental design includes four child-parent groups: control, child-only participation, parent-only participation, and child and parent participation. This allows us to analyze both the *direct* impact of program participation and its *indirect* effects within families.

Keywords: Environmental education, Spillovers, Adolescents, Parents, Intergenerational influence, Pro-environmental behavior and intentions, Randomized control trial, India
JEL Codes: D10, I20, C93, Q01, Q53, O10

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1 Introduction

Climate change presents a multifaceted challenge with serious and far reaching implications for communities globally. These include global temperature increases (Arnell and Reynard, 1996) as well as significant impacts on public health (Hathaway and Maibach, 2018; Cianconi et al., 2020), educational outcomes (Hanna and Oliva, 2016; Venegas Marin et al., 2024; Marchetta et al., 2019), and distributive equity (Mattoo and Subramanian, 2010). The International Panel on Climate Change (IPCC) highlights household behavior change as an important lever for reducing carbon emissions (Dietz et al., 2009). However, policymakers face significant challenges in devising and implementing effective household-level interventions to mitigate climate change impacts. A key question emerges: Who within the household should be targeted? Identifying the right target is critical, as climate change presents a unique challenge with its dual impact on current and future generations. While its effects on present generations often seem abstract, its consequences for future generations are profound (O'Donoghue and Rabin, 2015; Weber, 2010; Fuerst and Singh, 2018). In our current work, given the significance of this intergenerational dynamic, we examine intergenerational spillovers related to environmental behaviors within a household.

Recent research has made significant progress in identifying effective interventions to promote climate action, with educational interventions emerging as one of the most promising approaches (Bergquist et al., 2023; Nisa et al., 2019). However, a crucial aspect often overlooked in these studies is the potential for intervention spillovers—the indirect effects on individuals not directly targeted by the intervention. Spillovers have the potential to amplify an intervention's impact, enhancing its cost-effectiveness, and overall reach. This phenomenon has been well-documented in various domains, including voting behavior, health practices, agricultural techniques, and educational initiatives (Giné and Mansuri, 2018; Gilles et al., 2011; Berniell et al., 2013; Damerell et al., 2013), but they are not guaranteed (Chong et al., 2013; Jaime et al., 2023). The existence and magnitude of spillovers may vary depending on the specific issue addressed, the nature of the intervention, and the characteristics of the target population. Understanding when spillovers occur is crucial for designing more effective and far-reaching climate action strategies.

While impact of spillover have been recognized in various domains, there is a gap in research experimentally assessing the effectiveness of different intervention targets in creating these spillovers. Climate change, in particular, presents unique asymmetries between parents and

children, both in terms of environmental information salience and the capacity for pro-environmental action. These asymmetries likely extend to spillover effects as well. On one hand, parents play a crucial role in socializing their children, shaping their habits and beliefs (Jodl et al., 2001; Lawson et al., 2019a; Lazarides et al., 2015). On the other hand, children may be especially responsive to climate issues as they face the brunt of unmitigated climate change (Currie and Deschênes, 2016), potentially making them more effective advocates for environmental action (Bandura and Cherry, 2020). Given the pressing need for widespread collective action to address climate change, it is important to understand the dynamics of these spillovers in interventions aimed at increasing climate-related awareness and action. This understanding is key to maximizing the overall impact of these interventions by potentially leveraging intergenerational dynamics.

To address this question, we conduct a cluster randomized controlled trial (RCT) of a novel immersive sustainability education intervention targeted either at children, parents or both children and parents together. Following the intervention, we assess environmental awareness, attitudes, and behaviors among both parents and children. Given the intergenerational asymmetries in decision power and concern about climate change discussed above, a critical question is which intervention targets and outcomes are more likely to be impacted by environmental interventions. This design allows us to assess not only which group shows greater direct effects of the treatment, but also which pathway—children or parental education—is most effective for the transmission of treatment effects to others in the household.

Specifically, we answer three key questions. First, we assess the strength of the direct effects of an immersive environmental education curriculum among different intervention targets and on different outcome variables. This is important because educational interventions are more time-consuming and costly than simple nudges (Nisa et al., 2019), but they also have the potential to create deeper, broader, and longer-lasting change, including for behaviors but also beliefs, knowledge and attitudes (Van De Wetering et al., 2022; Hoang and Kato, 2016; Hartley et al., 2015). Second, this design allows us to understand the extent to which spillovers exist across different outcomes, from incentivized and costly behaviors to beliefs and attitudes. Third, it allows us to examine whether there are asymmetries in the strength of indirect effects depending on who is exposed to the treatment, and how this varies by different types of outcome variables. Additionally, by comparing spillover effects to the joint participation condition, which we expect to have the largest overall effects, we can assess the relative effectiveness and cost efficiency of these two

approaches for promoting climate-friendly behaviors through education programs.

Our field experiment involved 1,545 child-parent pairs (a total of 3,090 participants) in Patna, India, an urban low-income area facing a growing number of environmental challenges, including severe air pollution, inadequate solid waste management, and rising temperatures. In this context, we test the effects of exposure to a four-session immersive educational intervention developed by *VentureVillage* called the "Green Warriors" curriculum. The curriculum begins with factual information about climate change and the relationship between human actions and environmental degradation. This is followed by sessions aimed at inspiring participants to take climate action by offering practical steps they can implement to reduce their own environmental impacts, and encourage others to do so as well.

Child-parent pairs were randomly assigned to one of four groups: a control group with no exposure to the curriculum, a child-only group (T1) where only the child participates, a parent-only group (T2) where only the parent participates, and a joint child-parent group (T3) where both parent and child participate together. We separately measured the impact of the course on each member of the child-parent pairs. Specifically, we assessed impacts of the curriculum on various pre-registered outcomes of interest, including individual behaviors (e.g. donations, consumption choice, self-reported household behaviors, and a measure of civic engagement), discussions about climate change with friends and family, climate change knowledge, risk perceptions and self-efficacy.

Overall, we find that environmental education has positive direct and indirect effects on many our outcomes. Children who participated in the education program (T1) engaged in significantly more proenvironmental behaviors across all of our behavioral outcomes relative to children in the control group. They were more willing to wait for a recycled certificate, donated more to an environmental charity, reported engaging in more pro-environmental behaviors at home and having more discussions about climate change with friends and family. These results stand in contrast to the parent-only condition (T2), where we only see significant direct effects on certificate choice and climate change discussions. The effect sizes are similar in magnitude to those in the joint child-parent condition (T3), except for climate discussion among parents and proenvironmental behaviors among children, which were not significantly different from controls in this condition.

Exposure to the curriculum had a less pronounced direct impact on our non-behavioral outcomes. We see a significant and positive direct effect on climate risk perceptions among both

parents and children, and a significant direct effect on climate knowledge only among parents relative to the control group. Once again, we do not see pronounced differences between the direct effects of the curriculum when it is targeted at individuals or at parent-children dyads—specifically, we no longer find an increase in parent climate knowledge though their sense of efficacy increases.

These findings suggest that the direct effects of the curriculum are strongest for behavioral outcomes, especially among children who already show high levels of climate knowledge even at baseline. Our findings also suggest that the joint-participation treatment does not have added benefits above and beyond the sum of the individual-participation treatments, despite literature suggesting benefits to joint learning.

Importantly, we also find that the effects of the targeted interventions (T1 and T2) are amplified by indirect effects on members of parent-child dyads who were not directly exposed to the curriculum. Critically, we find that spillovers, where they exist, can be asymmetric and evident for only certain outcomes. Specifically, while we find bidirectional spillover effects on consumption choice relative to controls, the survey outcomes revealed a primarily unidirectional influence from children to parents on self-efficacy and risk perception.

Taken together, these results suggest that climate education interventions may benefit from targeting children rather than adults to maximize direct effects on behavioral outcomes and leverage the influence children have on their parents' sense of efficacy and risk perceptions—important precursors to climate action. Furthermore, while educational interventions are relatively costly and time-intensive, they could be integrated into school curricula where they could have broad reach with children—offering a natural path to scaling up this intervention. At the same time, our findings suggest that educational interventions cannot rely on spillovers to dramatically amplify their effects—at least in the short-term. And while targeting parents does not necessarily lead to strong spillovers on children, it does lead to significant direct effects on parents' environmental actions and attitudes, and to the extent that parents have greater agency over impactful household decisions, this is important in its own right.

We contribute to three key strands of literature. First, is on the spillovers from environmental interventions by examining the bidirectionality of spillover effects within households and comparing their magnitude between parents and children. While most studies focus on unidirectional spillovers—typically from parent to child or parent to child—this paper provides a more

comprehensive view of how environmental behaviors are transmitted across generations in both directions. Understanding whether and when spillovers exist can inform the design of interventions that maximize household-level environmental change, and is especially important for problems with intergenerational asymmetries, such as climate change, but also health and education.

Second, we contribute to the literature on climate change education interventions in two ways. While many studies focused on increasing household level proenvironmental behaviors tend to ignore the complexities of intrahousehold decision-making and power dynamics, we disentangle these effects by asking who should be targeted by an educational intervention to achieve the greatest effects in the household. Second, we evaluate the effectiveness of an innovative, immersive curriculum designed to engage participants in actionable climate change education. Targeting the right household member is crucial for designing cost-effective interventions, and testing the effectiveness of immersive curricula helps determine whether such approaches lead to more sustained behavioral change compared to traditional methods.

Lastly, we fill a gap in the literature on household dynamics by exploring how knowledge and behaviors are transmitted between parents and children, rather than among spouses (Jack et al., 2024; Conlon et al., 2021). This adds to the understanding of the broader household decision-making processes and the unique intergenerational learning that potentially occurs between parents and children, particularly in the context of climate change. Households are a critical unit for social learning, where parents often pass on knowledge and cultural norms to their children, shaped by their own education and experiences. Much of the research on intergenerational transmission of knowledge, attitudes, and behaviors positions parents as the primary socializing agents (Nelissen et al., 2019, Istead and Shapiro, 2014), with several studies exploring the influence of parents on their children's environmental attitudes and behaviors (Leppänen et al., 2012; Meeusen, 2014; Williams et al., 2017; Žukauskienė et al., 2021; Leppänen et al., 2012; Meeusen, 2014; Grønhøj and Thøgersen, 2009; Matthies et al., 2012). However, in the context of climate change, children may play a more prominent role agents of change due to the increased risks they face from its long-term impacts.

Recent studies indicate that children indeed influence the environmental behaviors of their families (Žukauskienė et al., 2021; Kuczynski and Parkin, 2007; Roy Ballantyne and Packer, 2001; Vognsen, 1994; Lawson et al., 2019b). For instance, Maddox et al. (2011) reported reduced waste after school sustainability programs, but fails to specifically attribute these results to the influence of children. In contrast, Jaime et al. (2023) find that while an environmental education program for

9-10-year-olds succeeded in changing childrens' knowledge, attitudes, and behaviors, it had no measurable effect on their parents. Despite the growing recognition of intra-household spillovers in environmental research, the question of whether parents or children serve as more effective conduits for spillovers has yet to be systematically explored. To our knowledge, there is no existing study comparing the bidirectional effects of the same environmental education intervention within the same household. This is important as understanding the comparative effectiveness of parents and children is crucial for designing policy tools that maximize household level impacts.

Comparing spillovers between parents and children is crucial for identifying the most effective pathway for transmitting environmental knowledge and behaviors within households. Understanding who—parents or children—serves as a stronger conduit for influencing household behaviors can inform the design of interventions that maximize the overall impact of climate education. If, for instance, children are found to be more effective at inducing behavior change in their families, education programs could focus more resources on youth-targeted interventions. Conversely, if parents exert a greater influence, adult education could be prioritized. The theory of change behind potential spillovers is that educational interventions on environmental issues can catalyze discussions within households, leading to a mutual learning process. Such dialogues not only increase awareness but also foster a shared sense of environmental responsibility, encouraging family members to adopt greener behaviors collectively. This shift is caused by a combination of potential factors: a sense of obligation to set a positive example for future generations, the motivational impact of observing a family member's enthusiasm for environmental stewardship, and the desire to align one's actions with those of one's family to maintain familial harmony and support.

Despite the potential for significant spillovers, the transfer of environmentally conscious behaviors from children to parents is *not* guaranteed. The hierarchical nature of some families could inhibit the transmission of new behaviors from children to parents, reflecting cultural norms that prioritize parental authority in matters related to their children's education and other aspects of their lives. We measure this using a *household hierarchical structure* as is traditionally explored in the literature. Further, the frequency and quality of family interactions is also likely to shape the opportunities for intergenerational transmission of norms. These dynamics underscore the complexity of designing interventions that effectively engage with and transform entrenched family structures and cultural norms.

This paper is organized as follows: section 2 provides the context of the field experiment; section

3 outlines the experimental design; section 4 discusses the data and outcomes; section 5 presents the results and explores the mechanisms; and section 6 concludes.

2 Context

The intervention is set in Patna, the capital city of the Indian state of Bihar. According to the Census of India (2011), Between 1971 and 2011, Patna's urban population increased fourfold, growing from 473,000 to 1.68 million. This period saw rapid and unplanned urbanization, leading to the growth of both formal and informal settlements and a scarcity of good quality housing.

Patna, one of India's fastest growing cities, presents an interesting setting for this study due to its local challenges. The city faces numerous environmental challenges, including air and water pollution, inadequate waste management systems, and uncontrolled urban sprawl. These are exacerbated by rapid population growth and urbanization, adding pressure to the city's infrastructure and natural resources (Ghose, 2014). There is increasing susceptibility to extreme weather events such as floods and heatwaves. These events pose significant risks to public health, infrastructure, and the local economy (Masson-Delmotte et al., 2021). Rising temperatures and shifting precipitation patterns are expected to worsen existing environmental issues, underscoring the urgency of developing and implementing effective adaptation and mitigation strategies (WHO, 2021).

Air pollution has become a major concern in Patna in recent years. The number of acute respiratory infection cases surged to over 1.2 million in 2019-20, up from just over 300,000 in 2018-19. In November 2023 (a month before our baseline), the city's air quality index (AQI) consistently exceeded 300, with air quality ratings remaining in the "very poor" category (Insight, 2023). Solid waste management is another pressing issue. The landfill site has already expanded to 82 acres, accumulating over 1.2 million metric tonnes of legacy waste. Improper disposal and the lack of adequate treatment facilities have led to waste accumulation, posing significant health and environmental risks (Times of India, 2023). Similarly, water pollution, particularly in the Ganga River, which flows through Patna, has been a long-standing problem. The discharge of untreated sewage and industrial effluents has rendered the river unfit for bathing (Down to Earth, 2024).

Given these challenges, Patna serves as an ideal setting for an environmental intervention aimed

at addressing the root causes of these issues while promoting sustainable development. By targeting school-going adolescents and their parents, the intervention seeks to mobilize community-wide responses to local environmental challenges. The context is also representative of other rapidly growing cities across the developing world, suggesting that the results could have implications beyond this specific context and could contribute to the broader objective of household behavioural change.

3 Experimental Design

3.1 Intervention: The "Green Warriers" Curriculum

In this study, we test the *direct* and *indirect* impacts of a novel environmental education course called "Green Warriors", designed to promote sustainable behaviors among individuals. This course was developed by *VentureVillage*—an organization based in Finland with an operational presence in India that designs and implements extra-curricular educational programs. We chose this curriculum as it focuses on increasing awareness of climate change and local environmental issues, as well as effective individual and household actions to mitigate environmental harms through in-depth, regular, and engaging lessons taught by enthusiastic and passionate educators over a few weeks (Ballantyne et al., 2001; Moser and Dilling, 2011; Sutherland and Ham, 1992). We collaborated closely with *VentureVillage* to adapt the curriculum to Patna's environmental challenges after extensive discussion with PMC, and local organizations. The trainers, tasked with delivering the course content, underwent comprehensive training by *VentureVillage* to ensure consistency of the curriculum and effectiveness of its delivery and to equip them with the skills of activity-based teaching.

The course consisted of four key thematic sessions, each approximately 30 minutes long. It aimed to enlighten students about the magnitude of climate change and local environmental challenges and the direct link between human actions and environmental harm. However, the goal was not only to raise awareness but also to encourage the adoption of practical environmental practices among participants.

The themes of the four sessions are as follows:

Session 1: Awareness and Identification of Environmental Problems

The first session is dedicated to raising awareness about the severity of environmental problems, using visual content such as puzzles, pictures, and videos. This session encourages participants to identify environmental problems within their immediate surroundings and highlights the connection between human actions and environmental impacts.

Session 2: Understanding Waste and Its Management

The second session focuses on everyday activities that contribute to waste generation and the broader implications of waste management at various levels (community, district, state, country, and global). Participants are encouraged to reflect on their personal habits and the impact of those habits on the environment.

Session 3: Behavioral Change Towards Environmental Sustainability

The third session encourages participants to consider the small steps they can take to create significant positive environmental change. Participants reflect on their own consumption habits to understand how positive actions can significantly influence the environment when adopted by thousands. The session emphasizes making eco-friendly decisions in everyday choices, thus encouraging a shift towards practices that support environmental well-being. Lastly, participants also learn about the history of environmental catastrophes, with a focus on the local context of Patna.

Session 4: Climate Activism and Pro-Environmental Campaigns

The final session aims to increase awareness of climate activism around the world and encourages the participants to think about and commit to pro-environmental campaigns. They learn about examples of environmental champions and are motivated to conceptualize and plan their pro-environmental campaigns within their schools or neighborhoods. This session ends with a discussion of the major messages from the program and a recap of the potential activities that participants can undertake to spread awareness and foster coordinated action toward environmental sustainability.

As the course progresses, it systematically expands on the above themes by emphasizing individual contributions to environmental degradation and the collective impact of these contributions at various levels: community, district, state, country, and globally. These messages are communicated through interactive activities, including a modified *Snakes and Ladders* game[1] and the

[1]The Snakes and Ladders game is a board game commonly played in India, designed for two or more players. The board is a grid of numbered squares, with certain squares connected by "ladders" and "snakes". Ladders (or green behavioral equivalents) allow players to skip ahead quickly, while snakes (non-green behaviors) send them backward. The goal is to move from the bottom of the board to the top, sustainable end of the board, guided by rolls of the dice.

Eco Treasure Hunt game. These activities, along with worksheets and discussions, aim to equip participants with the knowledge to recognize and track the environmental impacts of their everyday habits and choices and identify actionable steps toward more sustainable behaviors. According to the World Bank report on Education for Climate Action "*For information to spur action, those who receive the information must understand it, see it as actionable, care about the topic, and believe that their actions will improve outcomes.*" (Sabarwal et al., 2024) The curriculum is designed to instill a commitment to environmental stewardship, encouraging participants to undertake pro-environmental campaigns and to share their learning with peers and family members. The complete curriculum is attached in the Appendix A.5 and pictures from the field are in Appendix A.6.

3.2 Treatment arms

We test the overall impact of this curriculum in terms of direct effects on participants and its indirect effects through intergenerational spillovers. In particular, we seek to understand whether there are asymmetries in the extent of spillovers from *children to adults* or *adults to children*. To this end, we administer the curriculum in *four* distinct treatment arms:

1. **Child only (T1):** Only the child receives the intervention.
2. **Parent only (T2):** Only the parent receives the intervention.
3. **Child and Parent (T3)**: Both child and parent receive the intervention.
4. **Control group (C):** Neither child nor parent receive the intervention.

3.3 Sample Descriptive Statistics

Our study sample was drawn from n classrooms across, 11 private schools in Patna, the capital city of Bihar, and included both children and their parents. The selection of schools was based on school authorization and availability of children and parents during the academic calendar. The demographic composition of the households shows that the majority (96%) were Hindu, with 39% belonging to upper castes and 56% classified as Other Backward Classes (OBC). Socioeconomically, 21% of the households stated that they have a 'Below Poverty Line' card . Additionally, 24% of households had at least one member holding a government job, 26% owned a car, and 72% owned a house. The average

age of the children in the sample was 12 years, and they were enrolled in grades 6 to 8. We intentionally excluded grade 10 students from this intervention due to the upcoming externally administered "high-stakes" externally administered board examination, which coincided with our endline data collection. Notably, 53% of the children spoke English, and 66% were male. On the parental side, the average age was 37 years, with 65% of participating parents being mothers.

We show the descriptive statistics in Tables 1, 2, 3, and 4.

Table 1: Descriptive Statistics: Child Baseline Characteristics

	N	Mean	Std. Dev.	Min.	Max.
Child's gender (0=Female/1=Male)	1,545	0.66	0.48	0.00	1.00
Participating parent (0=Father/1=Mother)	1,545	0.65	0.48	0.00	1.00
Child's age	1,539	12.24	1.54	8.00	18.00
Child's grade	1,545	6.43	1.54	4.00	9.00
Can speak english fluently (1=Yes/0=No)	1,545	0.53	0.50	0.00	1.00
Contamination index (Child network mapping)	1,545	0.01	1.01	-0.62	7.63
Part of a sibling household (1=Yes/0=No)	1,545	0.10	0.30	0.00	1.00

NOTES: Descriptive statistics of the child characteristics as measured in the baseline.

Table 2: Descriptive Statistics: Parent and Household Characteristics (Part-1)

	N	Mean	Std. Dev.	Min.	Max.
Household demographics and socio-economic status:					
Parent's age Age	1,537	37.66	5.76	23.00	65.00
Owns below poverty line card	1,521	0.21	0.40	0.00	1.00
Household caste category:					
General category	1,527	0.39	0.49	0.00	1.00
Other backward class	1,527	0.56	0.50	0.00	1.00
Scheduled caste	1,527	0.05	0.21	0.00	1.00
Scheduled tribe	1,527	0.01	0.08	0.00	1.00
Household religion:					
Household religion: Hindu	1,542	0.96	0.20	0.00	1.00
Household religion: Muslim	1,542	0.04	0.19	0.00	1.00
Household religion: Other	1,542	0.00	0.06	0.00	1.00

NOTES: Descriptive statistics of the parent and household characteristics as measured in the baseline.

Table 3: Descriptive Statistics: Parent and Household Characteristics (Part-2)

	N	Mean	Std. Dev.	Min.	Max.
Household income (Monthly):					
Monthly income: Less than INR ten thousand	1,393	0.09	0.29	0.00	1.00
Monthly income: INR Ten to thirty thousand	1,393	0.46	0.50	0.00	1.00
Monthly income: INR Thirty to sixty thousand	1,393	0.32	0.47	0.00	1.00
Monthly income: INR Sixty thousand to hundred thousand	1,393	0.10	0.29	0.00	1.00
Monthly income: INR Greater than Rs. hundred thousand	1,393	0.03	0.17	0.00	1.00
Household assets:					
Household asset: Owns car	1,545	0.26	0.44	0.00	1.00
Household asset: Owns bike/motorcycle	1,545	0.80	0.40	0.00	1.00
Household asset: Owns air conditioner	1,502	0.30	0.46	0.00	1.00
Household asset: Owns refrigerator	1,535	0.82	0.38	0.00	1.00
Household asset: Owns computer/laptop	1,507	0.46	0.50	0.00	1.00
Household asset: Owns washing machine	1,515	0.50	0.50	0.00	1.00
Household asset: Owns room heater	1,499	0.35	0.48	0.00	1.00

NOTES: Descriptive statistics of the parent and household characteristics as measured in the baseline.

Table 4: Descriptive Statistics: Parent and Household Characteristics (Part-3)

	N	Mean	Std. Dev.	Min.	Max.
Parent occupation:					
Occupation: Not working outside home	1,467	0.02	0.15	0.00	1.00
Occupation: Government job	1,467	0.24	0.43	0.00	1.00
Occupation: Private firm employee	1,467	0.30	0.46	0.00	1.00
Occupation: Owns business (both small and large)	1,467	0.42	0.49	0.00	1.00
House ownership:					
Stays in Own House	1,538	0.72	0.45	0.00	1.00
Stays in rented house	1,538	0.28	0.45	0.00	1.00
How many rooms are there in your house?	1,539	3.96	2.75	1.00	40.00
Parent education:					
Never went to school	1,521	0.03	0.17	0.00	1.00
Upto primary school	1,475	0.11	0.31	0.00	1.00
Upto grade 10	1,334	0.26	0.44	0.00	1.00
Upto grade 12	990	0.29	0.45	0.00	1.00
Master's degree & beyond	1,494	0.12	0.32	0.00	1.00
Vocational training	1,521	0.02	0.14	0.00	1.00

NOTES: Descriptive statistics of the parent and household characteristics as measured in the baseline.

3.4 Randomization

We employed a staggered randomization approach at the school level, with random assignment into the three treatment and control groups at the section level.[2] The treatment assignment was conducted at the section level rather than the individual level to minimize treatment contamination due to discussions among students from different treatment groups, which could potentially compromise the integrity of the experimental design.

The allocation of of sections into treatments was stratified across three dimensions: (1) the students' grade level, (2) the section size, and (3) the section's contamination propensity score. The contamination propensity score is calculated at the section level, by mapping students' peer networks based on data obtained at baseline. During the baseline survey, each student listed their top five most frequently interacted peers, categorized into three groups: (1) peers within the same classroom, (2) peers within the same grade but outside their classroom (i.e., other sections in the same grade), and (3) peers in other grades. For each section, denoted as 'A', the latter two categories were aggregated to identify other sections with a high likelihood of cross-contamination from interventions applied in section 'A'. Subsequently, a contamination index was computed for each section and used for stratification, ensuring that the proportion of high-contamination classrooms was balanced across all treatment groups. For additional details on the construction of the section-level contamination propensity scores, please refer to Appendix A.2. Table 5 indicates that, contamination index is near zero for classrooms across all four treatments.

During the baseline, we also identified 156 sibling pairs within the sample. To avoid confounding effects within households, particularly the impossibility of assigning siblings to different treatment conditions, we decided to limit participation to only one sibling per household. One sibling was randomly selected from each household to participate in the study, resulting in a final sample size of 3,090 students.

3.5 Sample Balance

The balance checks for child, parent, and household characteristics across treatments are presented in Tables 5, 6, 7, and 8.

[2]Every grade is divided into multiple sections to maintain a class size recommended by Education Department, Government of Bihar.

Table 5: Balance Table: Child Baseline Characteristics

Variable	Mean Control	Mean T1 (Child Only)	Mean T2 (Parent Only)	Mean T3 (Child and Parent)	diff (2)-(1)	diff (3)-(1)	diff (4)-(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Child's gender (Male or Female)	0.707	0.679	0.590	0.654	-0.058*	-0.111***	-0.013
	(0.456)	(0.467)	(0.492)	(0.477)	(0.034)	(0.035)	(0.038)
Participating parent (Father or Mother)	0.682	0.604	0.637	0.675	-0.022	-0.054	-0.007
	(0.466)	(0.490)	(0.481)	(0.469)	(0.035)	(0.034)	(0.038)
Child's age	12.331	12.463	12.169	11.885	0.039	-0.045	-0.699***
	(1.704)	(1.351)	(1.460)	(1.628)	(0.111)	(0.106)	(0.128)
Child's grade	6.618	6.659	6.391	5.904	-0.099	-0.040	-0.985***
	(1.807)	(1.314)	(1.347)	(1.614)	(0.111)	(0.102)	(0.126)
# Household members	6.307	6.421	6.293	6.267	-0.140	-0.051	-0.142
	(3.212)	(3.340)	(4.392)	(3.406)	(0.245)	(0.286)	(0.275)
Can speak english fluently	0.573	0.516	0.503	0.525	-0.020	-0.027	-0.045
	(0.495)	(0.500)	(0.501)	(0.500)	(0.037)	(0.036)	(0.041)
Contamination index (Child network mapping)	-0.008	0.082	-0.030	-0.019	0.029	-0.039	-0.078
	(0.992)	(1.034)	(0.983)	(1.064)	(0.076)	(0.073)	(0.086)
Part of a sibling Household	0.099	0.108	0.121	0.075	-0.007	0.011	-0.035
	(0.299)	(0.310)	(0.326)	(0.264)	(0.023)	(0.023)	(0.024)
Observations	403	399	463	280	1,545	1,545	1,545

NOTES: Standard errors are clustered at the school level (in parentheses). Columns (1) depicts the mean of the student characteristics for those who were in the control group. Columns (2)-(4) depict the mean of the child characteristics for those who are in the child-only (T1), parent only (T2) or in child and parent (T3) treatment groups respectively. Columns (5)-(7) depict the p-values for difference in means of the child characteristics of the respective treatment groups in comparison to the control group. All the indices were created using Anderson (2008). Refer to Table A1 for details about the index construction. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6: Balance Table: Parent and Household Characteristics (Part-1)

Variable	Mean Control	Mean T1 (Child Only)	Mean T2 (Parent Only)	Mean T3 (Child and Parent)	diff (2)-(1)	diff (3)-(1)	diff (4)-(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parent's age	37.729	38.020	37.475	36.663	0.281	0.113	-0.923*
	(6.000)	(6.124)	(5.946)	(6.289)	(0.453)	(0.435)	(0.503)
Owns below poverty line card	0.207	0.211	0.171	0.255	-0.006	-0.055*	0.012
	(0.405)	(0.408)	(0.377)	(0.436)	(0.030)	(0.028)	(0.034)
Household caste category:							
General category	0.401	0.389	0.374	0.389	0.066*	-0.045	-0.013
	(0.491)	(0.488)	(0.484)	(0.488)	(0.036)	(0.034)	(0.040)
Other backward class	0.549	0.550	0.571	0.560	-0.071*	0.033	0.009
	(0.498)	(0.498)	(0.495)	(0.497)	(0.036)	(0.035)	(0.041)
Scheduled caste	0.043	0.055	0.048	0.044	0.006	0.013	0.004
	(0.203)	(0.229)	(0.214)	(0.205)	(0.016)	(0.016)	(0.017)
Scheduled tribe	0.008	0.005	0.007	0.007	-0.001	-0.002	-0.000
	(0.087)	(0.071)	(0.081)	(0.085)	(0.006)	(0.006)	(0.007)
Household religion:							
Household religion: Hindu	0.955	0.965	0.970	0.935	-0.017	0.014	-0.034*
	(0.207)	(0.184)	(0.171)	(0.246)	(0.014)	(0.014)	(0.018)
Household religion: Muslim	0.042	0.033	0.026	0.061	0.015	-0.017	0.032*
	(0.202)	(0.178)	(0.159)	(0.240)	(0.014)	(0.013)	(0.018)
Household religion: Other	0.002	0.003	0.004	0.004	0.002	0.003	0.002
	(0.050)	(0.050)	(0.066)	(0.060)	(0.004)	(0.004)	(0.005)
Observations	403	399	463	280	1,545	1,545	1,545

NOTES: Standard errors are clustered at the school level (in parentheses). Columns (1) depicts the mean of the parent/household characteristics for those who were in the control group. Columns (2)-(4) depict the mean of the child characteristics for those who are in the child-only (T1), parent only (T2) or in child and parent (T3) treatment groups respectively. Columns (5)-(7) depict the p-values for the difference in means of the parent/household characteristics of the respective treatment groups in comparison to the control group. All the indices were created using Anderson (2008). Refer to Table A1 for details about the index construction. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 7: Balance Table: Parent and Household Characteristics (Part-2)

Variable	Mean Control	Mean T1 (Child Only)	Mean T2 (Parent Only)	Mean T3 (Child and Parent)	diff (2)-(1)	diff (3)-(1)	diff (4)-(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Household income (Monthly):							
Monthly income: Less than INR ten thousand	0.086	0.102	0.093	0.097	0.007	-0.011	-0.007
	(0.280)	(0.303)	(0.291)	(0.297)	(0.023)	(0.022)	(0.024)
Monthly income: INR Ten to thirty thousand	0.429	0.444	0.501	0.467	-0.047	0.026	0.027
	(0.496)	(0.498)	(0.501)	(0.500)	(0.039)	(0.038)	(0.042)
Monthly income: INR Thirty to sixty thousand	0.338	0.331	0.296	0.315	0.028	0.008	0.004
	(0.474)	(0.471)	(0.457)	(0.465)	(0.037)	(0.036)	(0.040)
Monthly income: INR Sixty thousand to hundred thousand	0.102	0.102	0.083	0.097	0.021	-0.008	-0.006
	(0.303)	(0.303)	(0.276)	(0.297)	(0.024)	(0.022)	(0.026)
Monthly income: Greater than INR hundred thousand	0.046	0.023	0.027	0.023	-0.009	-0.016	-0.019
	(0.209)	(0.149)	(0.162)	(0.151)	(0.014)	(0.014)	(0.016)
Household assets:							
Household Asset: Owns car	0.310	0.243	0.240	0.257	-0.003	-0.057*	-0.025
	(0.463)	(0.429)	(0.427)	(0.438)	(0.032)	(0.032)	(0.037)
Household Asset: Owns bike/motorcycle	0.811	0.787	0.812	0.800	-0.019	0.009	-0.001
	(0.392)	(0.410)	(0.391)	(0.401)	(0.030)	(0.029)	(0.033)
Household asset: Owns air conditioner	0.360	0.230	0.308	0.293	-0.030	-0.049	-0.021
	(0.481)	(0.422)	(0.462)	(0.456)	(0.030)	(0.032)	(0.036)
Household asset: Owns refrigerator	0.829	0.804	0.851	0.796	0.004	0.012	0.009
	(0.377)	(0.398)	(0.357)	(0.404)	(0.028)	(0.026)	(0.031)
Household asset: Owns computer/laptop	0.487	0.424	0.482	0.421	0.015	0.012	-0.014
	(0.500)	(0.495)	(0.500)	(0.495)	(0.036)	(0.036)	(0.040)
Household asset: Owns washing machine	0.524	0.442	0.525	0.505	0.036	0.017	0.019
	(0.500)	(0.497)	(0.500)	(0.501)	(0.035)	(0.035)	(0.039)
Household asset: Owns room heater	0.408	0.304	0.338	0.370	-0.040	-0.038	0.020
	(0.492)	(0.460)	(0.474)	(0.484)	(0.035)	(0.035)	(0.040)
Observations	403	399	463	280	1,545	1,545	1,545

NOTES: Standard errors are clustered at the school level (in parentheses). Columns (1) depicts the mean of the parent/household characteristics for those who were in the control group. Columns (2)-(4) depict the mean of the child characteristics for those who are in the child-only (T1), parent only (T2) or in child and parent (T3) treatment groups respectively. Columns (5)-(7) depict the p-values for the difference in means of the parent/household characteristics of the respective treatment groups in comparison to the control group. All the indices were created using Anderson (2008). Refer to Table A1 for details about the index construction. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 8: Balance Table: Parent and Household Characteristics (Part-3)

Variable	Mean Control	Mean T1 (Child Only)	Mean T2 (Parent Only)	Mean T3 (Child and Parent)	diff (2)-(1)	diff (3)-(1)	diff (4)-(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parent occupation:							
Occupation: Not working outside home	0.018	0.035	0.025	0.007	0.022*	0.006	-0.010
	(0.134)	(0.184)	(0.155)	(0.086)	(0.013)	(0.011)	(0.010)
Occupation: Government Job	0.244	0.229	0.230	0.276	0.015	0.015	0.080**
	(0.430)	(0.421)	(0.422)	(0.448)	(0.033)	(0.032)	(0.037)
Occupation: Private firm employee	0.315	0.332	0.275	0.299	0.013	-0.087**	-0.045
	(0.465)	(0.471)	(0.447)	(0.458)	(0.037)	(0.034)	(0.040)
Occupation: Owns Business (Both Small and Large)	0.415	0.394	0.452	0.407	-0.050	0.059	-0.027
	(0.493)	(0.489)	(0.498)	(0.492)	(0.038)	(0.037)	(0.042)
House ownership:							
Stays in own house	0.731	0.773	0.661	0.707	-0.067**	-0.028	-0.037
	(0.444)	(0.419)	(0.474)	(0.456)	(0.030)	(0.032)	(0.035)
Stays in rented house	0.269	0.227	0.339	0.293	0.067**	0.028	0.037
	(0.444)	(0.419)	(0.474)	(0.456)	(0.030)	(0.032)	(0.035)
How many rooms are there in your house?	3.958	4.412	3.621	3.903	-0.029	-0.181	-0.049
	(2.615)	(3.420)	(2.450)	(2.204)	(0.221)	(0.176)	(0.196)
Parent education:							
Never went to school	0.025	0.049	0.020	0.029	0.009	-0.012	-0.005
	(0.157)	(0.215)	(0.139)	(0.169)	(0.014)	(0.011)	(0.014)
Upto primary School	0.090	0.105	0.105	0.139	-0.016	0.000	0.029
	(0.287)	(0.307)	(0.307)	(0.347)	(0.022)	(0.022)	(0.026)
Upto grade 10	0.207	0.309	0.280	0.224	0.067*	0.034	-0.014
	(0.406)	(0.463)	(0.449)	(0.418)	(0.034)	(0.033)	(0.037)
Upto grade 12	0.289	0.272	0.296	0.306	-0.063	-0.027	0.008
	(0.454)	(0.446)	(0.457)	(0.462)	(0.041)	(0.041)	(0.046)
Master's degree & beyond	0.126	0.127	0.114	0.107	0.049**	0.017	0.013
	(0.332)	(0.334)	(0.318)	(0.309)	(0.024)	(0.023)	(0.027)
Vocational training	0.023	0.018	0.024	0.011	0.007	0.008	-0.008
	(0.149)	(0.133)	(0.153)	(0.104)	(0.010)	(0.011)	(0.011)
Observations	403	399	463	280	1,545	1,545	1,545

NOTES: Standard errors are clustered at the school level (in parentheses). Columns (1) depicts the mean of the parent/household characteristics for those who were in the control group.Columns (2)-(4) depict the mean of the child characteristics for those who are in the child-only (T1), parent only (T2) or in child and parent (T3) treatment groups respectively. Columns (5)-(7) depict the p-values for the difference in means of the parent/household characteristics of the respective treatment groups in comparison to the control group. All the indices were created using Anderson (2008). Refer to Table A1 for details about the index construction. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

3.6 Statistical Power

We present power calculations for our primary outcomes, described in Table A7. We use our baseline sample of 1,545 children to calculate the outcome mean and standard deviation.[3] We conduct two-tailed hypothesis tests using a 5% significance level and power of 0.8. We account for the clustering of standard errors and use our baseline data to calculate the intra-cluster (i.e., intra-section) correlation (ICC). We have approximately 33 clusters per arm with a median cluster size of 18 children. We are well-powered to detect conservative effect sizes of 0.05 standard deviations on our primary outcomes, i.e., the "direct effect" of our environment curriculum on the amount of green donations of children (and their parents).

The focus of our study is estimating the intergenerational spillover of pro-environmental knowledge and behaviors within the household, i.e. from child to parent and vice-versa. Since the design and context of our study are novel, we lack a directly comparable study to draw from for an estimate of the indirect effects (i.e. spillovers) of our intervention. However, given that we can detect small effect sizes even with conservative assumptions, we believe our study is powered to detect the indirect effects of our intervention. For instance, if we assume a modest estimate of 0.2 standard deviations for our direct effects, our study would be well-powered to accommodate efficiency losses of nearly 75% of the direct effect for our indirect effect. Thus, despite the inherent uncertainties, we expect to be well-powered to detect the indirect effects of the intervention.

4 Data Collection, Outcomes, and Hypotheses

4.1 Baseline Data Collection

As the first step, we obtained consent from students and their parents in all participating schools, indicating their willingness to take part in the study. The sample selection process was conducted in a staggered manner, school by school, after identifying eligible schools based on approval from the Head of School and student availability for the baseline according to the academic calendar. Once a school was selected, baseline surveys were conducted in two stages. First, we administered the baseline to all students from whom we had obtained both child and parent consent. Our enumerators then conducted household visits to collect baseline data from all consenting parents. Further details

[3] All power calculations are conducted using the willingness to pay outcome.

regarding the field operations can be found in Appendix A.4.

The baseline survey for the study was carried out from December 6, 2023, to January 29, 2024. The child baseline survey took place in the participating schools, while the parent baseline survey was conducted at their respective homes. To facilitate the parent baseline survey, enumerators scheduled individual appointments with each participating parent. Female enumerators administered the parent baseline surveys, interviewing each parent separately to ensure privacy and confidentiality.

4.2 Household Intervention Visits

Households assigned to the treatment groups received a total of six visits, which included four interactive environmental education sessions conducted by the enumerators at their homes and two data collection rounds (baseline and endline) for the participating parent. Each of the four environmental education sessions was delivered during a separate visit to the household. On the other hand, control group households were visited only twice, once for the baseline survey and once for the endline survey, without any environmental education sessions in between. The average duration between the completion of the baseline survey and the administration of the endline survey was approximately two months for all participating households. Figure 1 presents this timeline.

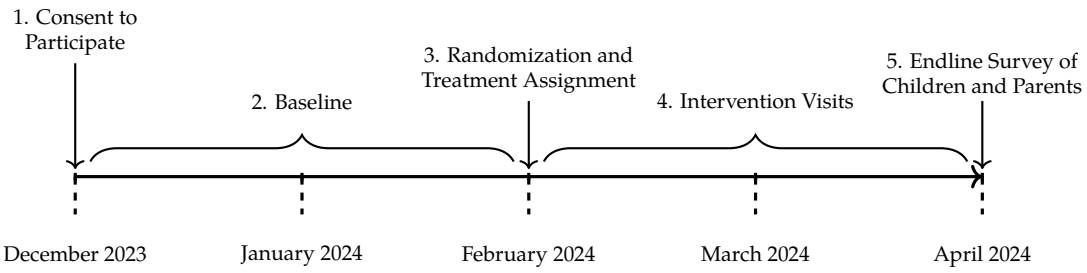

Figure 1: Timeline of the Survey Experiment

4.3 Outcomes

4.3.1 Behavioral Outcomes

To evaluate the curriculum's effectiveness, we focus on behavioral outcome measures that align with the course content and its thematic progression. Specifically, we measure participants' willingness to donate to an environmental cause, their choice of green products (e.g., a recycled certificate), their self-reported pro-environmental behaviors, and their discussions about environmental issues within

their households.

Green Donations: We measure participants' willingness to take costly actions to address environmental issues using an incentive compatible, experimentally elicited willingness to pay (WTP) question in which respondents can allocate their earnings towards an environmental organization. Participants have a 1 in 6 chance to win 100 INR by rolling a die. Before rolling, they decide whether to donate some money to one of two organizations: one focused on waste management and the other on helping children. We examine which organization participants choose to donate to and the amount they decide to donate. Our outcome measure is the total sum donated by the participants to the environmental organization, coding the choice of the alternative organization or no donations as 0.[4]

Consumption Choice: We measure both the children's and parents consumption choices. Specifically, at the end of the course, all participants (children and parents) receive a completion certificate. They have the option to either receive a certificate printed on standard paper right away or receive a certificate on recycled paper with a one-week delay. The decision to select the option of recycled paper was coded as a binary variable.[5]

Pro-environmental Behaviors: In the baseline and endline surveys, we asked both parents and children to indicate how often either they or their family members engaged in a number of pro-environmental activities such as segregating waste and switching to efficient light bulbs. For details of the activities see Table A3.

Discussions About Climate Change: We assessed self-reported discussions about climate change with friends, family, and community members using normalized responses. For details about the specific wording of the question and the response options provided, please refer to Table A3.

4.3.2 Survey Outcomes

We further assess the effectiveness of the curriculum with four secondary outcome measures that correspond to the course content and its thematic progression.

Climate Change Knowledge Index: To assess participants' awareness and understanding of climate change and local environmental issues, we use a knowledge index constructed from four questions.

[4] Refer to Table A1 for detailed descriptions of all the primary outcomes.
[5] Refer to Table A2 for detailed descriptions of all the secondary outcomes.

The index is created by aggregating and standardizing the responses to each question. Table A1 provides a detailed description of the index construction process.

Self-Efficacy: We measure participants' perceived impact and effectiveness of their own actions, as well as individual actions more generally, in addressing local environmental challenges and contributing to climate change mitigation using 6 questions. These questions are aggregated into a single efficacy index by summing and standardizing the responses to each question. The details of the index construction are provided in Table A1.

Risk Perceptions: We evaluate participants' concerns and perceptions regarding the risk and impact of climate change through four questions. Detailed information on specific questions and index construction is provided in Table A2.

4.4 Hypotheses

We have the following two sets of hypotheses regarding the direct and indirect impacts of the environmental education course.

The first hypothesis focuses on the direct effects of the course on its participants. Specifically, we posit that:

H1: *The curriculum will positively influence treated participants' pro-environmental attitudes and behaviors compared to a control condition. Specifically, it will increase knowledge and awareness of environmental challenges, perceived efficacy of individual actions in addressing environmental challenges, and willingness to donate to environmental organizations.*

The second hypothesis focuses on the indirect effects or spillovers from the course on the parent or child who did not directly participate in the course. We hypothesize that:

H2: *The curriculum will positively influence pro-environmental attitudes and behaviors for those in Child-Parent dyads who were not directly exposed to the treatment, compared to a control condition. Specifically, the curriculum will positively influence knowledge and awareness of environmental challenges, perceived efficacy of individual actions in addressing environmental challenges and increase willingness to donate to an environmental organization.*

The magnitude of these spillover effects is uncertain, and we do not hypothesize a-priori about which pathway–*parent-to-child* or *child-to-parent*–will exhibit larger indirect effects. We adopt an

exploratory stance regarding the comparative magnitude of these indirect influences.

4.5 Empirical Specification

Below we describe our primary regression specifications to identify direct and indirect effects of the treatment.

We estimate the following intent to treat (ITT) empirical specification for the primary outcome variables:

$$Y_{i,t=1} = \beta_0 + \beta_1 P + \beta_2 T_1 + \beta_3 T_2 + \beta_4 T_3 + \beta_5 (P * T_1) + \beta_6 (P * T_2) + \beta_7 (P * T_3) + \beta_8 Y_{i,t=0} + \beta_9 X_i + e_i$$

where $Y_{i,t=1}$ is the primary outcome variable of individual i (which can be a parent or a child) measured at endline and $Y_{i,t=0}$ is the same outcome measured at baseline. P is the indicator variable that takes value 1 if i is a parent and 0 if child. T_1 is an indicator for the 'Child Only Treatment', T_2 is an indicator for the 'Parent Only Treatment', and T_3 is an indicator for the 'Child + Parent Treatment'. X_i is a vector of control variables that will be selected through a double LASSO procedure and school-fixed effects. Standard errors are clustered at the section level at which the intervention is randomized.

All hypotheses for children are compared to the child baseline β_0 and for parents are compared to the parent baseline $\beta_0 + \beta_1$.

We test the following:

Direct effects:

H1.a: *The direct effect of participating in the course for the child is measured by comparing β_2 to β_0.*

H1.b: *The direct effect of participating in the course for the parent is measured by comparing β_6 to $\beta_0 + \beta_1$.*

H1.c: *The direct effect of attending the course jointly is β_4 (compared to the baseline β_0) for children and β_7 (compared to the baseline $\beta_0 + \beta_1$) for parents.*

Spillovers:

H2.a: *The spillover effects on the child when their parent receives the course (i.e., the treatment T_2) is β_3 compared to the child baseline β_0.*

H2.b: *The spillover effects on the parent when their child received treatment (i.e., the treatment T_1) is β_5 compared to the parent baseline $\beta_0 + \beta_1$.*

5 Results

Following the empiricial specification mentioned above, we analyze the results separately for children and parents. For children, Treatment 1 (T1) measures the direct effect on the child when only the child is treated. Treatment 2 (T2) measures the spillover effect on the child when only the parent is treated. Treatment 3 (T3) measures the combined effect when both the parent and child are treated.

5.1 Behavioural Outcomes

We first examine the effect of the curriculum on behavioral outcomes, specifically green donations, the choice of green certificates, self reported pro-environmental behaviors, and discussions. Table 9 presents the regression estimates based on the specification outlined in the above section.

Green Donations: We find a direct effect of 7.02 INR ($p < 0.05$) on green donations among children who underwent the curriculum, compared to those in the control group. This significant increase suggests that the curriculum effectively instills pro-environmental behaviors in children when they are directly engaged. Moreover, we observe a combined effect of 7.70 INR ($p < 0.05$) when both parents and children undergo the curriculum. This indicates that joint participation in the curriculum increases its impact, suggesting that involving both parents and children in educational initiatives enhances the program's effectiveness, possibly due to mutual reinforcement of pro-environmental values and behaviors within the household. However, there is no spillover effect when only parents are treated, implying that parents alone may not significantly influence their children's willingness to donate through indirect exposure.

For parents, there is no significant effect on green donations, regardless of whether they directly participated (T2), participated with their children (T3), or if their children participated (T1).

Table 9: Behavioral Outcomes

	Green Certificates		Pro-Environment Behavior		Green Discussions		Green Donations (Rs.)	
	Child	Parent	Child	Parent	Child	Parent	Child	Parent
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
T1: Child Only (Direct Effect)	0.22***		0.20**		0.40***		7.02**	
	(0.06)		(0.08)		(0.11)		(2.72)	
T2: Parent Only (Spillover Effect)	0.24***		0.12		0.10		2.66	
	(0.06)		(0.08)		(0.08)		(2.37)	
T3: Child + Parent (Joint Effect)	0.29***		0.14*		0.35***		7.70**	
	(0.06)		(0.08)		(0.12)		(2.96)	
T1: Child Only (Spillover Effect)		0.26***		0.07		0.08		-0.19
		(0.06)		(0.09)		(0.08)		(2.55)
T2: Parent Only (Direct Effect)		0.25***		0.03		0.21**		0.04
		(0.05)		(0.09)		(0.10)		(2.65)
T3: Child + Parent (Joint Effect)		0.27***		-0.01		0.21		-3.32
		(0.05)		(0.08)		(0.13)		(2.92)
Control Mean	0.53	0.51	0.00	0.00	3.30	3.14	17.78	18.98
Observations	2892	2892	2892	2892	2892	2892	2892	2892
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Control			Yes	Yes			Yes	Yes
LASSO Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NOTES: Standard errors clustered at the section level (in parantheses). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Baseline controls are included for all the outcomes for which baseline data is available. For calculating the donation amounts to green charity, all the donation amounts to non-green charities were coded to 0. Columns (1) and (2) depict the co-efficients for the choice of eco-friendly certificates by the child and parent respectively. Columns (3) and (4) depict the co-efficients for the (self-reported) pro-environment behavior index of the child and parent respectively. The pro-environment behavior indices are constructed using Anderson (2008).Columns (5) and (6) depict the co-efficients for the willingness to discuss about climate change with friends, family or neighbours by the child and parent respectively. Columns (7) and (8) depict the co-efficients for donations (in Rs.) made to green charity by the child and their parent respectively. All the columns use survey data.

Choice of a green certificate: In terms of selecting a green certificate, we observe significant effects for children across all conditions: direct participation, spillover, and joint participation, with effect sizes of 22, 24, and 29 percentage points, respectively, all significant at the 1% level. Children who directly participated in the curriculum (T1) chose the recycled certificate more often than those in the control group, highlighting the curriculum's impact on their consumption choices. A combined effect is also observed when children participated with their parents (T3), further reinforcing these behaviors. Additionally, a spillover effect is found when only parents participated (T2), suggesting that parents can model pro-environmental behaviors effectively, which their children then adopt.

For parents, direct participation in the curriculum (T2) resulted in a significant effect of 0.25 percentage points in choosing the recycled certificate. A combined effect of 27 percentage points is observed when parents participated with their children (T3). Furthermore, a spillover effect of 26

percentage points occurs when only children participated (T1), indicating that children's participation can influence their parents' pro-environmental behaviors, measured through green consumption.

Comparing choice of a green certificate and willingness to donate, we we see an impact on parents for green certificate, but there is no effect on green donations. One possible conjecture for this difference is that choosing a green certificate involves a tangible decision that directly aligns with consumption behavior and immediate environmental benefits. This decision might feel more concrete and actionable to parents, making it easier for them to change their behavior based on the curriculum. On the other hand, green donations might be influenced by additional factors such as financial consideration or skepticism about the effectiveness of donations. [RS to @all: Can we say this because it is an experiment and these factors should be the same in treatment and control, no?] Additionally, parents might already have established patterns and beliefs about charitable giving that are less easily altered by short-term educational interventions.

Climate Change Discussions: We find that direct participation in the curriculum by children (T1), either alone or with their parents (T3), significantly increases their engagement in discussions about climate change within their social circles, with effect sizes of 40 and 35 percentage points, respectively ($p < 0.01$). However, when only parents participate (T2), this effect does not transfer to their children and they do not engage as much in this discussion. It could be that direct involvement in the curriculum may better equip children with the language and confidence needed to talk about climate change, which is not as effectively imparted through parental influence alone. For parents, we see a direct effect from their participation in the curriculum (T2) (effect size 21pp; $p < 0.05$), meaning they engage in climate change discussions. However, there is no joint effect when they participate alongside their children (T3), nor is there a spillover effect from their children's participation (T1).

One possible reason for these effects is that parents may require direct involvement in the educational content to feel knowledgeable and confident enough to engage in discussions about climate change. When parents participate directly, they gain firsthand information and a deeper understanding, which empowers them to initiate and partake in conversations about environmental issues. However, parents may not feel adequately informed or motivated to discuss climate change based solely on their children's participation.

Self-Reported Environmental Behaviors: Children who directly participated in the curriculum (T1) reported more of these behaviors. The same pattern was observed with children who participated in the curriculum along with their parents (T3) and for those whose parents participated in the program (T2), but these effects were marginal. For parents, we do not see any effect. One possible explanation for the of effects on parents is that they may already exhibit these pro-environmental behaviors (such as switching off lights, segregating waste) and see the curriculum primarily as a way to instill these behaviors in their children.

5.2 Survey Outcomes

We now turn to an examination of the effects of the curriculum on climate change knowledge, self-efficacy, and risk perceptions. The curriculum provided factual information about climate change and was designed to increase knowledge and awareness. Tailored to the local context of Patna, the curriculum linked climate change impacts to participants' daily lives, which may shape their risk perceptions. Additionally, it included actionable steps aimed at inspiring participants to take action, potentially increasing their sense of self-efficacy. Table 10 shows the regression estimates for the survey reported outcomes.

Climate Change Knowledge: For children, we do not find significant changes in climate change knowledge across the treatment conditions. Knowledge was assessed through three questions that measured overall understanding of climate change, belief in its occurrence, and knowledge of its causes. These questions were presented in a multiple-choice format, requiring respondents to select the correct answer from the given options. While the effects are not statistically significant, we observe some trends that suggest potential differences between the treatment groups. Children who directly participated in the curriculum (T1) or jointly with parents (T3) reported higher knowledge levels compared to the control group (T1: 56.33%; T3: 53.70%; C: 46.68%). In contrast, children in the parent-only condition (T2) showed no difference from the control (T2: 46.34% vs. C: 46.68%). Additionally, belief that climate change is happening was already high among children in the control group (87.98% of respondents agreeing that climate change is happening). This high baseline likely contributed to a ceiling effect, limiting the potential for further improvements in treatment groups. Across all groups, over half of the children in the baseline were able also to correctly identify the causes of climate change, indicating a reasonable level of foundational knowledge.

Table 10: Survey Reported Outcomes

	Climate Knowledge		Climate Self Efficacy		Climate Risk Perception		Perceived Social Norms	
	Child	Parent	Child	Parent	Child	Parent	Child	Parent
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
T1: Child Only (Direct Effect)	0.06		0.09		0.33***		0.16*	
	(0.07)		(0.07)		(0.07)		(0.08)	
T2: Parent Only (Spillover Effect)	0.02		-0.01		0.12		0.08	
	(0.08)		(0.07)		(0.07)		(0.08)	
T3: Child + Parent (Joint Effect)	0.01		0.04		0.32***		0.26***	
	(0.08)		(0.09)		(0.08)		(0.09)	
T1: Child Only (Spillover Effect)		0.02		0.15**		0.19***		0.10
		(0.07)		(0.07)		(0.07)		(0.08)
T2: Parent Only (Direct Effect)		0.15**		0.11		0.26***		0.10
		(0.07)		(0.07)		(0.06)		(0.08)
T3: Child + Parent (Joint Effect)		0.01		0.17**		0.23***		0.15*
		(0.09)		(0.09)		(0.09)		(0.09)
Control Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	2892	2892	2892	2892	2892	2892	2892	2892
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LASSO Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NOTES: Standard errors clustered at the section level (in parantheses). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Baseline controls are included for all the outcomes for which baseline data is available. Columns (1) and (2) depict the co-efficients for the climate change knowledge index, Columns (3) and (4) depict the co-efficients for the self-efficacy towards climate change index, Columns (5) and (6) depict the co-efficients for the risk perception towards climate change and, Columns (7) and (8) depict the co-efficients for the perceived social norms towards climate change index. All the indices are constructed using Anderson (2008).

In contrast, for parents, the curriculum had a significant impact on climate change knowledge, but only when parents participated in the curriculum directly. In the parent-only treatment (T2), parents exhibited an increase in knowledge (15 percentage points, $p < 0.05$), whereas no significant effects were observed in the joint treatment (T3), where both parents and children participated, or in the child-only condition (T1). These findings suggest that direct engagement with the curriculum is necessary for improving parents' knowledge of climate change, with no spillover effects from children's participation.

Self-Efficacy: For children, no significant changes in climate self-efficacy were observed across any of the treatment conditions. Whether children participated in the curriculum alone, jointly with their parents, or not at all, their sense of efficacy regarding climate issues remained unchanged. By contrast, we observe significant effects on parents. Parents' self-efficacy increased substantially when they participated in the curriculum alongside their children (T3), with an increase of 17 percentage points ($p < 0.05$). Spillovers of a similar magnitude was observed when only the children engaged

with the curriculum (T1), resulting in a 15 percentage point increase in parental self-efficacy ($p < 0.05$). Interestingly, there is no direct effect on parents who participate in the curriculum (T2). These results suggest that indirect exposure through their children or participating jointly with their children positively influences parents' confidence in their ability to address climate change.

Risk Perceptions: We find an increase in the risk perceptions of children in both the direct and joint treatment conditions. Children who participated in the curriculum (T1) demonstrated a 33 percentage point increase in perceived risk ($p < 0.01$), while those who participated together with their parents (T3) showed a 32 percentage point increase ($p < 0.01$). These results suggest that the curriculum heightened children's perceptions of the risks associated with climate change, especially in terms of their worry and concern about its impacts. Importantly, no spillover effects were detected—children's perceptions were unaffected by their parents' participation in the curriculum unless they themselves directly engaged with it.

For parents, all treatment conditions resulted in an increase in risk perceptions relative to the control group. Parents who directly participated in the curriculum (T2) experienced a 26 percentage point increase ($p < 0.01$), slightly smaller than the effect observed for children in the direct treatment (33 pp). We also observe spillovers: parents whose children participated in the curriculum (T1) exhibited a 19 percentage point increase in perceived risk ($p < 0.01$), indicating that children's engagement had an influence on their parents' perceptions of climate change risks. Parents who participated jointly with their children (T3) also showed a 23 percentage point increase in risk perception ($p < 0.01$).

5.3 Measures of Intervention Effectiveness

To assess participants' responses to the curriculum delivery, we collected data on three intermediate outcomes: engagement during the session, distractions, and homework completion rates. This data was gathered through an enumerator survey, with enumerators responding to a series of questions either before (homework completion) or after each session (engagement and distraction). The questionnaire is presented in the appendix.

Homework Completion: From the second section onwards, participants were asked whether they had completed their homework sheet distributed in the previous session. Participants submitted the completed homework sheet to the enumerator, who then uploaded a photo of it. There is a noticeable

difference between parents and children in homework completion rates, which may be attributed to children being more accustomed to finishing homework as part of their school curriculum and parents having other everyday commitments. Figure 2 plots the proportion of respondents who completed the homework (out of relevant number of people who belonged to their group and had attended the session).

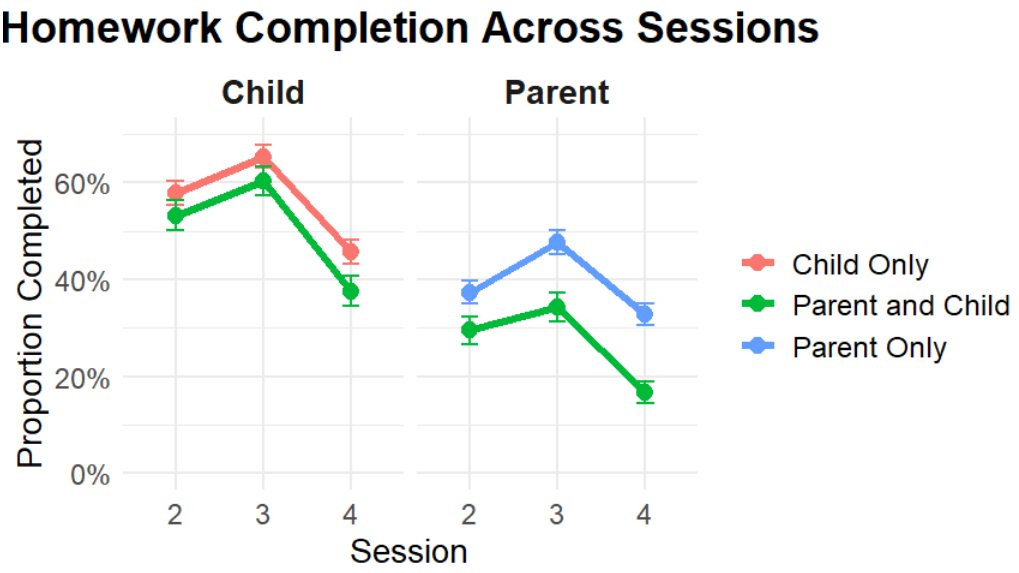

Figure 2: Homework Completion Rates

Engagement: Five questions were asked after each session to assess participants' engagement. The questions included the following: "During the course of the session, the child/parent asked questions relevant to the course," "The student/parent was attentive throughout the session," "The student/parent seemed to enjoy doing the session activities," "The student/parent wanted me to finish the session quickly as she had to do other things," and "The student/parent was able to summarise the session well after I finished." Responses were recorded on a 5-point Likert Scale (1 = Strongly agree, 5 = Strongly Disagree). The engagement score is computed by aggregating the scores across the five questions, and figure 3 presents the means summarized by treatment group, session, and respondent type.

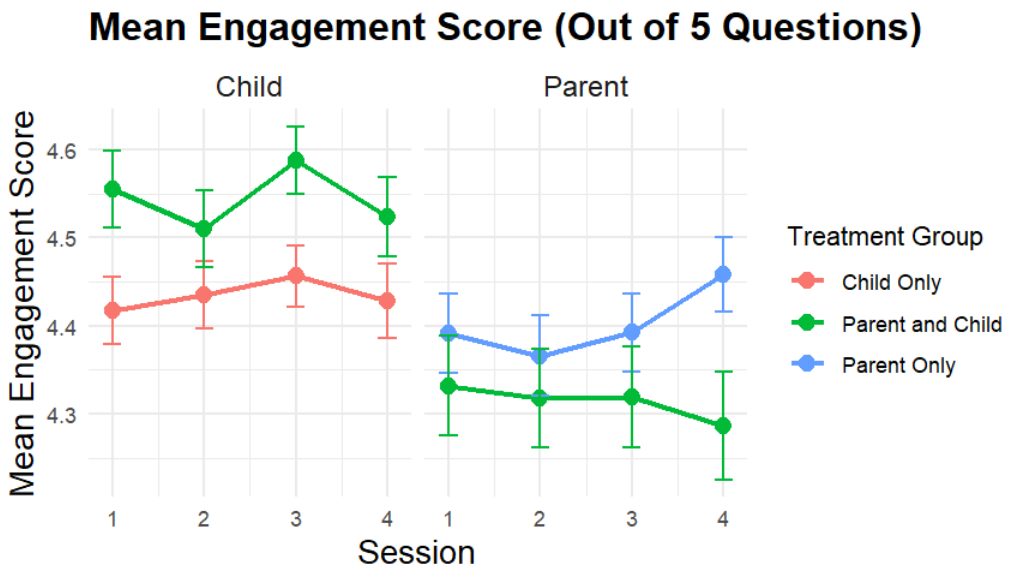

Figure 3: Engagement Score

Distraction: We asked the enumerators three questions that focused on distractions. They were: "There was a lot of background noise which made it difficult for the student/parent to hear when I was speaking", "I had to ask other family members to not help the student/parent while the curriculum was being delivered," "There were a lot of other interruptions during the session." The questions were on a 5 point Likert Scale (1 = Strongly agree, 5 = Strongly Disagree). The distraction score was calculated by summarizing the mean across treatment groups, sessions, and respondent types and is presented in figure 4

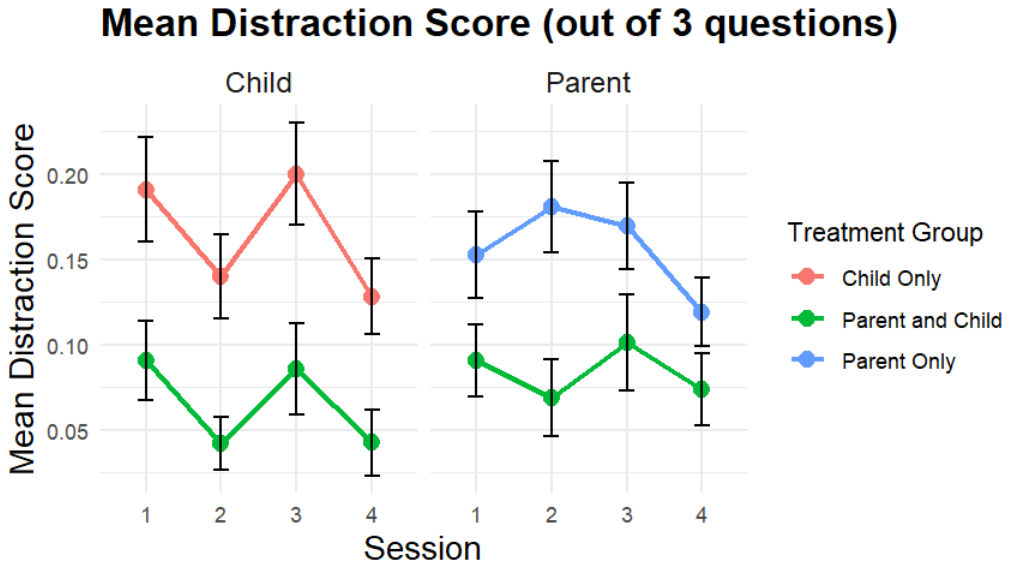

Figure 4: Distraction score

6 Conclusion

Our randomized experiment with child-parent pairs reveals that environmental education programs can have impacts beyond direct participants, potentially influencing family members. Children who participated in this novel curriculum exhibited increased pro-environmental behaviors and engaged in more environmental discussions. Interestingly, while parental participation *did not* significantly affect their children's pro-environmental behaviors through spillover effects, it did lead to increased environmental actions and improved attitudes among the parents themselves.

These findings raise an important question about the specificity of spillover effects in behavior change. We observed spillovers in certain behaviors but not others, suggesting that some pro-environmental actions may be more susceptible to intra-household transmission. For instance, adopting green certificates—a relatively simple and low-cost action—appeared more likely to spread within households. Notably, when spillovers did occur across the range of behavioral outcomes we measured, they tended to be *bidirectional*, influencing both parents and children.

Our analysis of survey-reported measures reveals a consistent direction of influence from children to parents. We observed strong spillover effects on parents' self-efficacy and risk perception measures when their children participated in this novel curriculum. In contrast, children's knowledge and efficacy remained unaffected regardless of whether they participated alone, with their parents, or if only their parents attended. However, direct participation in the course (either alone or with their parents) did increase children's risk perceptions. Notably, we found *no observable spillovers* onto children's survey-reported measures when only the parents attended the course. While parental participation did not significantly affect their children's knowledge and risk perceptions through spillover effects, it did lead to improvements in parents' own outcomes.

Our intermediate outcomes suggest that the implementation of the intervention was successful. The findings also indicate that targeting both children and parents in environmental education initiatives may not necessarily be doubly effective. Instead, these programs can maximize impact by leveraging intergenerational influence within households, promoting a culture of shared environmental responsibility.

Overall, our findings suggest a nuanced pattern of intergenerational influence in environmental education, with implications for program design and the targeting of interventions to maximize both

direct and indirect effects on family members. Future research could further explore the mechanisms behind these differential spillover effects and their implications for policy design in environmental education and behavior change interventions.

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A Appendices

A.1 Steps for Index Construction

We follow the methodology proposed by Anderson (2008) to create variance-weighted indices.[6]

The outcome variables are comprised of several individual questions (usually 5-point likert scale or Agree/Disagree scale). We aggregate these individual questions and create an index by taking the weighted-average value of these individual variables. The weights are constructed by normalizing the variables such that they have same standard deviation and following Anderson (2008), the weights from the inverse covariance matrix is recovered.

Following process is followed by Anderson (2008) for index construction:

(i) For all variables, the positive direction always indicates a more "environment friendly" outcome. We recode all the variables for which the scale was reversed in the original question, such that a higher value continues to indicate a more environment friendly outcome.

(ii) For questions that used a 5-point Likert scale, a corresponding binary variable is created. This binary variable is coded as 1 if the respondent answered "Strongly Agree" ("Strongly Disagree") or "Agree" ("Disagree") for a question containing an environmentally progressive (regressive) statement, and 0 otherwise.

(iii) Standardization of each individual variable takes place by demeaning the variables and subsequently dividing them by the control group standard deviation. We create standardized variables $(\tilde{y})$ using this process.

(iv) Compute covariance matrix $\widehat{\sum}$, which consist of elements:

$$\sum_{mn}^{\wedge} = \sum_{i=1}^{Nmn} \frac{(y_{im} - \bar{y}_m)}{\sigma_m^y} * \frac{(y_{in} - \bar{y}_n)}{\sigma_n^y}$$

where, N_{mn} is the number of observations (total persons with non-missing data for variables m and n).

(v) Next, we invert the covariance matrix, and define weight w_k for each variable k by summing the entries in the row of the inverted covariance matrix:

[6] Refer to Haushofer and Shapiro (2016); Fiala et al. (2022) for a recent application.

$$(\overset{\wedge}{\sum})^{-1} = \begin{bmatrix} c_{11}....c_{1K} \\ ..... \\ ..... \\ c_{K1}....c_{KK} \end{bmatrix}$$

$$w_k = \sum_{l=1}^{K} c_{kl}$$

(vi) Finally create a new variable, $\hat{y}_i$, that is a weighted average of $\tilde{y}_{ik}$ for person i. When constructing $\hat{y}_i$, weight its inputs, standardized variables $\tilde{y}_{ik}$ by the inverse of the covariance matrix of the transformed variables. A simple way to do this is to set the weight on each outcome equal to the sum of its row entries in the inverted covariance matrix for area. The index variable $\hat{y}_i$ is called because this transformation yields a generalized least squares estimator Anderson (2008) .

$$\hat{y}_i = \Big(\sum_{k \in K} w_k \Big)^{-1} \sum_{k \in K_i} w_k * \frac{y_{ik} - \bar{y_k}}{\sigma_k^y}$$

A.2 Contamination Propensity Index Score

This index was calculated by mapping the peer network data gathered at baseline for every child. Following steps were followed for the index construction:

(i) The contamination index used for the randomization is constructed from a "sender's only" perspective. We map the peer network data at the section level, grade level and finally, at the school level.[7]

(ii) Since our unit of randomization is at the section level, the within section networks are not considered for the calculation of our "contamination score." Only the grade and school level networks are considered for our calculations, since they contribute towards the potential "contamination" in our study.

(iii) Each child is assigned a raw contamination score against each of the network categories. For example, if the child speaks to 5 students within the section level, a raw score of 5 is assigned to this child. The same scoring pattern is followed for the remaining two categories.

[7]The minimum raw score which the child can receive is 1, since we made it compulsory to name at least one friend that they speak to within their grade and within their school (but outside the section). The maximum score for both the categories is 6 as per the child baseline data.

(iv) We convert these raw scores into index scores by using Anderson (2008). Refer to Section A.1 for details on the index construction. Following this, each child is associated with a contamination propensity index score, which is calculated by aggregating grade level and school level contamination scores.

(v) Since our unit of randomization is at the section level, we represent the level of contamination for a particular section by contamination propensity score of the median student.

(vi) Similarly at the school level, we calculate the median contamination among all the sections.

(vii) Following the above steps ensures that each section and each school is represented by its respective median contamination score.

(viii) Lastly, we classify whether a section is above or below the median level of contamination by using a binary variable. This variable takes a value 1 if the median contamination level of the section is greater than or equal to the median contamination level for the particular school and 0 otherwise. This variable is used as a stratification variable in our randomization.

A.3 Outcome Definitions

Appendix Table A1: Outcomes: Indices and Definitions

Outcomes Indicator	Definition
Willingness to donate (WTP) to a green organization (individual and household level)	Participants have a 1 in 6 chance of winning 100 INR by rolling a dice. Before the roll, they can opt to donate part of their potential winnings to one of two charities: an environmental one or one supporting children. *We assess the amount paid by the participants to green charity*.
Climate Change Knowledge Index (individual and household level)	*To assess climate change knowledge, beliefs about its existence, local impacts, and causal attributions, we asked the following questions.* 1. How much do you know about climate change? (1-I know nothing; 4 - I know a lot) 2. Do you think that climate change is happening? (1- Yes; 2-No) 3. Which of the following do you think is most accurate? Climate change is … (1- Caused mostly by human activities; 2- Caused equally by human activities and natural changes; 3- Caused mostly by natural changes in the environment; 4- None of the above because climate change isn't happening) 4. How strongly do you agree or disagree with the following statement: Climate change is affecting the weather in India by increasing droughts, floods, and extreme heat (1- Strongly Agree; 5- Strongly Disagree) 5. How strongly do you agree or disagree with the following statement? Climate change is affecting the weather in Bihar by increasing droughts, floods, and extreme heat (1- Strongly Agree; 5- Strongly Disagree)
Self-Efficacy (individual and household level)	*We asked the following to measure how participants view the impact and success of their actions and others', in tackling local environmental problems and climate change.* Response Options: (1- Strongly Agree; 5- Strongly Disagree) 1. Small individual actions (such as wasting water or electricity) can add up to a large negative impact on the local environment and climate change. 2. There is no use in taking individual actions to better the local environment or address climate change because they have limited impact. 3. I can make a difference in solving climate change. 4. I can make a difference in solving the local environmental challenges. 5. Through my political actions (e.g. protests, communicating with officials), I can make a difference in addressing local environmental issues and climate change. 6. My actions to improve the local environment and mitigate climate change will encourage others to do the same.

The table contains detailed descriptions of all the primary outcomes. All outcome measures are collected for parents and children separately. Details for index construction provided in the section A.1.

Appendix Table A2: Outcomes: Indices and Definitions

Outcomes Indicator	**Definition**
Choice of Certificate (Child and Parent)	Participants choose between two options: a certificate printed on regular paper available immediately, or one printed on recycled paper available with a one-week delay.
Volunteering (Child only)	Whether the participant add their name to a list from which 5 child volunteers will be selected after the end of the study for an environmental activity.
Civic Engagement (Parents only)	A measure of whether a parent issued an environmental complaint through the official complaint mechanism.
Classroom Advocacy (Child only)	Whether a child adds signs up to be potentially selected to deliver a 10-minute speech promoting eco-conscious behavior in their classroom. At the end of the study, we randomly select 3 students to give the talk.
Climate Change Worry and Risk Perceptions Index	1. How worried are you about climate change? (-) (1-very worried; 4-not worried at all) 2. To what extent will climate change harm future generations of people? (-) (1-A great deal; 4-Not at all) 3. How much do you think climate change will harm you personally? (-) (1-A great deal; 4-Not at all) 4. To what extent will climate change harm people in Bihar? (-) (1-A great deal; 4-Not at all) Details for index construction provided in the section A.1.

The table contains detailed descriptions of all the secondary outcomes. All outcome measures are collected for parents and children separately.

Appendix Table A3: Exploratory Outcomes: Indices and Definitions

Outcomes Indicator	Definition
Self-reported Environmental Behaviors	1. Separated waste into food waste and other type of waste materials 2. Recycled products 3. Composted food waste 4. Recycled newspapers and other paper waste 5. Recycled plastic waste 6. Looked for ways to reuse things 7. Carried own cloth bag when going shopping 8. Carried own water bottle when leaving the house 9. Used paper bags instead of plastic bags 10. Turned off electrical appliances whenever left a room 11. Switched-off the fridge during longer holidays 11. Unplugged/Switched off electronic devices 12. Checked efficiency labels when buying household electronics 13. Changed light bulbs to energy-saving lighting Details for index construction provided in the section A.1
Discussions about Climate Change	1. In the past 2-3 weeks, how often did you speak with friends, family, or people in your community about climate change? Response Options: 5-pt Likert (Once per day - Not at all)
Perceived Social Norms	1. Thinking about kids at your school, what fraction do you think are worried about climate change? 2. Now thinking about all of the people in your community, what fraction do you think are worried about climate change? 3. Thinking about kids at your school, what fraction do you think regularly take actions to address climate change? 4. Thinking about kids at your school, what fraction do you think regularly take actions to address local environmental issues? 5. Now thinking about all of the people in your community, what fraction do you think regularly take actions to address climate change? 6. Now thinking about all of the people in your community, what fraction do you think regularly take actions to address local environmental issues? Response Options: 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100%

The table contains detailed descriptions of the exploratory outcomes. All outcome measures are collected for parents and children separately.

Appendix Table A4: Exploratory Outcomes: Indices and Definitions

Outcomes Indicator	Definition
Hierarchy Vignette	*Deepa and Rajesh have a child, Anjali, who is in class 7 at [School Name]. She was recently offered the opportunity to participate in a prestigious science competition, which requires extra classes on weekends. The family is considering what to do.* 1. Who do you think will most likely make the final decision about Anjali's participation in the weekend classes? (1-Anjali; 2-Deepa (the mother); 3-Rajesh (the father); 4-Deepa and Rajesh together; 5-The entire family together) 2. How influential do you think Anjali's parents opinions are in determining whether s/he participates in the weekend? (1-Not influential; 2-Somewhat influential; 3-Neither; 4-Highly influential; 5-The only opinions that matter) 3. Imagine if Anjali was [Child Name]. Who would make the decision about his/her participation in the weekend classes? (1-[Child Name]; 2-[Child Name]'s Mother; 3-[Child Name]'s Father; 4-Both Mother and Father; 5-Entire family together) 4. Imagine if [Child Name] was in Anjali's situation, how likely would [Child Name] be to insist on his/her preference despite your family's differing opinion? (-)(1-Very unlikely; 5-Very likely) 5. [For children] Think of five friends of yours. If they had a child in Anjali's situation, how many of those children do you think would go against their family's wishes if they did not match their own desires? (0-0; 1-1; 2-2; 3-3; 4-4; 5-5)

The table contains detailed descriptions of the vignette used to measure hierarchy for the parents. An adapted version of the questions are used for children. All outcome measures are collected for parents and children separately.

Appendix Table A5: Exploratory Outcomes: Indices and Definitions

Outcomes Indicator	**Definition**
Child-Parent Interaction Index	1. [Child Name] feels comfortable talking to me about his/her values and beliefs (-) 5-pt Likert (Strongly agree - strongly disagree) 2. I often ask [Child Name] about his/her day (e.g. what did you do in school, what did you learn, did the teacher say anything, etc.) (-) 5-pt Likert (Strongly agree - strongly disagree) 3. I encourage [Child Name] to express his opinions (-) 5-pt Likert (Strongly agree - strongly disagree) 4. I help [Child Name] with his/her class assignments/homework (-) 5-pt Likert (Strongly agree - strongly disagree) 5. I regularly monitor [Child Name]'s studies (-) 5-pt Likert (Strongly agree - strongly disagree) 6. How frequently do the following situations take place in your household: Having dinner together with your family (-) (1-Once or Twice a Month; 2-Once a week; 3-Multiple times per week; 4-Almost Everyday; 5-Never) 7. How frequently do the following situations take place in your household: Going to the theatre together with the family (-) (1-Once or Twice a Month; 2-Once a week; 3-Multiple times per week; 4-Almost Everyday; 5-Never) 8. How frequently do the following situations take place in your household: Going outside with your family for a meal (-) (1-Once or Twice a Month; 2-Once a week; 3-Multiple times per week; 4-Almost Everyday; 5-Never) 9. How frequently do the following situations take place in your household: Going for shopping with your family (-) (1-Once or Twice a Month; 2-Once a week; 3-Multiple times per week; 4-Almost Everyday; 5-Never)

The table contains detailed descriptions of the child-parent interaction index for the parents. An adapted version of the questions are used for children. All outcome measures are collected for parents and children separately.

A.4 Field Operations

A.4.1 Field team composition:

The field team from DAI Research and Advisory Services consisted of 45 enumerators, 6 supervisors, 1 field manager, and 2 project assistants. The field team reported to 1 Senior Research Associate and 1 Research Manager, who was responsible for checking the data quality and ensuring the data collection and intervention activities were undertaken as per the research design and ethics protocols.

A.4.2 Survey data collection

Student baseline: The baseline data collection was conducted between December 2023 and January 15, 2024. The data collection took place at the school level after obtaining necessary approvals from the school management and consent from the respective student-parent pairs.

The field team scheduled prior appointments with the school management before the day of data collection. The baseline surveys for students were conducted in the school classrooms. Depending on the class sizes and the number of students who expressed their interest in participating in our study, the school management provided us with classroom spaces accommodating a maximum of 40 students per class. The baseline surveys were self-administered, and each student was provided with a tablet. The baseline survey instrument (coded in Survey CTO) was pre-loaded on each device. At least two enumerators were present in each classroom, and they were responsible for providing the necessary instructions and guidelines for the self-administered survey. The enumerators were trained to address any technical difficulties faced by the students while answering the questions, and they were also responsible for clarifying any conceptual issues in the comprehension of a question.

Parent baseline: The parent baseline survey was successfully conducted between December 28, 2023, and January 29, 2024. The parent baseline data collection was conducted at the household level. Necessary approvals and appointments were obtained from the participating parents before the data collection visit by the enumerator. The baseline surveys were enumerator-administered. The enumerators were trained to address any technical difficulties faced by the parents while answering the questions, and they were also responsible for clarifying any conceptual issues in the comprehension of a question.

A.5 Curriculum

Appendix Table A6: Green Warriors Session Plan for children

Session 1

Key Objectives:
To make students identify environmental problems near their house and to make them think of the connection between human actions and environmental changes.

Lesson Description:
The session will start with a pre- program assessment. In the first activity, the student will be given 2 puzzles. By understanding the contrast between these 2 images, the student will be able to visualise the intensity of problems due to waste generation. After this, the student will watch a video on the intensity of problems due to climate change. At the end of the class, the student will be given an assignment to identify environmental problems near their house and will be given a format for creating a report on the same.

Learning Outcomes:
• Student will be able to (SWBAT) learn about global scale of environment related problems.
• SWBAT understand that human actions cause damage to the environment.
• SWBAT identify environmental problems near their house.
• SWBAT discuss with parents about the environmental changes over the last 30 years.

Materials Required:
•Pre - program assessment – 1 copy per student
• Puzzles – 2 A4 size puzzles per facilitator
• Homework Sheet – 1 copy per student
• Tablet – 1 per facilitator

Session 2

Key Objectives:
To make students aware about:
• Everyday activities that generate waste at an individual level
• Scale of the waste management problem when waste is aggregated at various levels (community, district, state, country, globe etc)
• Positive and negative impact of human actions on the environment around us

Session Description:
The session starts with a recap of the previous session as well as the sharing of the homework from the previous day. After this, the facilitator will distribute a worksheet that will help the student identify everyday activities that contribute to waste generation. The student will then play a game modelled on the Snakes and Ladders game through which he/she will learn about the various causes and effects of environmental pollution. The session will end with a quick recap and sharing of homework sheet along with the instructions for completing the homework.

Learning Outcomes:
• Student will be able to (SWBAT) identify their habits that cause environmental problems
• SWBAT learn about positive and negative consequences of human actions on the environment
• SWBAT gain better understanding of their own contribution to the waste management problem through the waste tracking activity

Materials Required:
• Activity sheet – 1 copy per student
• Homework sheet – 1 copy per student
• Tablet – 1 per facilitator
• Link to Snakes and Ladders Game

Note: An adapted version of the same curriculum is used for parents. Contents and language of delivery is made age appropriate for parents.

Appendix Table A7: Green Warriors Sesion Plan

Session 3

Key Objectives:
To make students:
• Understand that small steps that individuals take can create massive positive changes when aggregated
• Commit to habit changes that they can carry out at an individual level
• Understand the practicalities of leading an environment friendly life and familiarise themselves with environment friendly choices currently available when carrying out everyday tasks
• Learn the history of environmental catastrophes in their home state

Session Description:
The session starts with a recap of the previous session as well as a discussion on the homework from the previous session. After this, the teacher will distribute a worksheet that will make each student think of changes that they can bring about in their own life. The student will then play the Eco Treasure Hunt game where they will gain awareness of environment friendly choices available to them when carrying out everyday tasks. The session will end with a quick recap and sharing of homework videos and homework sheet along with the instructions for completing the homework.

Learning Outcomes:
• Students will be able to (SWBAT) identify behavioural changes that they can incorporate in their lives to lead more environment friendly lives and will take a pledge to carry out these positive habits
• SWBAT understand the practical aspects of leading an environment friendly life and will think about the balance between environment friendly choices and the cost of these choices
• SWBAT learn the history of environmental catastrophes that have struck Bihar in recent years

Materials Required:
• Activity sheet – 1 copy per student
• Homework sheet – 1 copy per student
• Tablet – 1 per facilitator
• Links to Homework Videos – 3
• Link to Eco Treasure Hunt Game

Session 4

Key Objectives:
To make students:
• Aware of climate activism by their peers around the world
• Think about pro-environmental campaigns that they can carry out
• Commit to pro-environmental campaigns that they will be able to conduct within their school or in the neighbourhood

Session Description:
The session starts with a recap of the previous session as well as a discussion on the homework from the previous session. After this, the facilitator will show 2 videos of young environmental champions and will hold a discussion with the student on whether they can carry out similar pro-environmental campaigns in their school or in their neighbourhood. The session will end with a recap of the major learnings from the program and a discussion on potential activities that students can carry out.

Learning Outcomes:
• Student will be able to (SWBAT) get inspired by pro-environmental activities undertaken by other students of their age
• SWBAT commit to leading an environment friendly life themselves as well as to share their learnings with friends and family members
• SWBAT identify a project that they can work on with their friends to spread awareness of environmental problems and the need for coordinated human action to bring about changes

Materials Required:
• Tablet – 1 per facilitator

A.6 Field Images

Appendix Figure A1: Facilitator training conducted by VentureVillage

Appendix Figure A2: Child baseline at school

Appendix Figure A3: Parent engaged in the curriculum

Appendix Figure A4: Child engaged in puzzle