Exploring Frameworks for Civic Engagement for Public School Students in Karachi

This study evaluates the impact of a school-based civic club program designed to enhance climate change awareness, civic engagement, general knowledge, attitudes, and skills among public school students in Karachi, Pakistan. Using a randomized controlled trial (RCT) design, baseline and endline surveys were conducted over one academic year with both treatment and control groups. Three complementary estimation strategies — Basic Regression, Analysis of Covariance (ANCOVA), and Difference-in-Differences (DiD) — were employed to assess program impact and ensure robustness of results.

Across all methods, the intervention yielded statistically significant improvements in Climate Change Knowledge, General Knowledge, and Attitudes, with consistent effect sizes after adjusting for baseline differences and accounting for time trends. No statistically significant changes were detected in Civic Engagement or Skills, suggesting that these domains may require longer-term, experiential interventions to produce measurable change.

While the study benefits from a rigorous RCT design and multiple analytical approaches, limitations include the relatively short implementation period, reliance on self-reported measures, some attrition, and the urban-specific context. The findings demonstrate the potential of structured, school-based civic clubs to improve knowledge and attitudes in the short term, while highlighting the need for extended follow-up, behavioral indicators, and broader implementation to foster sustained engagement and skill development.

1. Introduction

Climate change is arguably one of the most critical issues that we face today. It not only has significant environmental impacts, but it also has severe social, political, and economic implications. We also stand at a crucial point in time where if drastic steps are not taken for mitigation and adaptation, we will cross the point of no return and leave the future generations with catastrophic damage that cannot be reversed.

Pakistan contributes less than 1% to global greenhouse gas emissions. While the total emissions are relatively low, they are trending upwards due to population growth, urbanisation, and higher energy demands. And yet, Pakistan is one of the most adversely impacted countries as a result of climate change due to its geographic vulnerability and the frequent occurrence of extreme weather events. The glacial melts in the north and the rising sea levels in the south are both detrimental to the population and the country's infrastructure. The changing weather patterns and erratic precipitation also impacts the agriculture sector, resulting in food insecurity and economic upheaval. All of this results in internal displacement, health risks, and worsening social inequity. Being a developing country with relatively weaker systems in place, climate change further worsens the standard of living.

Unfortunately, Pakistan also has a low literacy level and the education system needs to be strengthened significantly. There is a general lack of climate awareness among the public which hinders any initiatives taken to mitigate the impacts of climate change, and thus, a joint effort between the education system, civil society, media, and local government is needed to raise awareness about climate change (Jan, Khan, & Mahsud, 2020).

The public education system is expansive and thus offers a good opportunity to create a large scale impact. It can not raise awareness about climate change through additions in the curriculum, but the public schools also serve as a gateway into the community. For an issue like climate change, it is critical to educate all the stakeholders, and to ensure the spread of localised knowledge and lived experiences. A lot of work is being done to mitigate climate change impacts, and a lot of focus is put on how individuals contribute to carbon emissions or how lifestyle changes can help prevent contribution to greenhouse gas emissions. Yet, the worst emissions come from industries and large corporations, instead of individuals. It is also not feasible for many in the developing countries, especially people living below the poverty line, to "live sustainably" due to the higher costs.

Hence, the civic club project does not aim to solve climate change. Its goal is to raise awareness about climate change so that the lived experiences can be better contextualised and understood. It seeks to create local networks where mitigation efforts and adaptation strategies directly benefit the local communities. It serves to give youth a platform where they can raise their voice and take local actions in order to promote civic and community engagement.

In the next section, background information is provided about civic clubs, as well as a brief survey of literature on the topic. Section 3 outlines the theory of change, while section 4 discusses the data used in this paper and provides descriptive statistics. Section 5 discusses the methodology used in this paper, including outlining the estimation strategy. Section 6 provides the results of the regression analysis which are discussed alongside other findings in section 7. Section 8 highlights the limitations of this paper and notes some avenues for further research. Lastly, section 9 summarises the paper and gives concluding remarks.

2. Background and Literature Review

Pakistan has one of the highest young populations in the world, with around 64% of its population under the age of 30 (UNDP Pakistan). This demographic trend is especially evident in Karachi, where the median age is 21 (Worldometers), suggesting a significant youth population. With Karachi's estimated population of 18 million, the city likely has over 7 million young people.

Introducing a civic engagement club for 8th graders in Karachi's public schools offers a significant opportunity to foster a generation of informed, active citizens. Engaging students at this formative stage equips them with foundational knowledge about their rights, responsibilities, and the importance of active community participation. This early education can lead to a more engaged and informed citizenry in the long term. These students will reach adulthood and be eligible to vote in three years. Engaging them now helps prepare them for the responsibilities of adulthood, including informed voting, understanding civic duties, and actively participating in community development. By fostering leadership skills and a sense of civic duty among 8th graders, these students can be leaders in their own neighbourhoods. These students will carry the lessons learned through the club into their high school years and beyond, positively influencing their peers and communities. Participation in civic activities complements academic learning by enhancing critical thinking, problem-solving, and communication skills. It also boosts students' confidence and sense of agency, encouraging them to take initiative in various aspects of their lives.

Engaging 8th graders in civic projects allows them to contribute fresh perspectives and innovative solutions to local issues, fostering a sense of ownership and responsibility. A civic

engagement club aligns with broader educational goals by promoting holistic development. It supports the curriculum while providing practical experiences that make learning relevant and meaningful.

The impact of engaging 8th graders extends beyond the individual. As these students become more engaged, they can influence their families, friends, and neighbourhoods, creating a ripple effect that strengthens civic-mindedness throughout Karachi. Hence, the Civic Clubs project aims to create a platform that can be leveraged by students to raise awareness about climate change and empower them to take small actions to address these issues. The project design rests on four key principles:

- Sustainability – for the model to succeed, it needs to be sustainable and require minimal external support, both in financial and technical.

- Participatory – it should not use a top-down approach where these communities are "educated", but rather empower them to be independent in their actions.

- Simplicity – it focuses on public schools and a younger population as a gateway into the community, hence it should not be a very complicated intervention or have an overuse of jargon that would distance the project from young students.

- Meaningful – at the same time, it should not be a superficial intervention, but one that makes a connection with the students, exposes them to the nuances of social issues, and builds a framework for them to be able to take action on their own.

There are two key reasons for working with public schools: the massive scale of the public school system; and the lacklustre administrative structure of the public schools. The project

is being tested at public schools to determine if the model works. If it does, then it can be scaled up across all public schools and have a larger impact. Secondly, if the model works in public schools, it can easily be adapted (and expanded) for private schools that typically have better administrative structures and resources.

Civic education plays an important role in increasing active citizenship, which is crucial for the development of societies. Abudu and Fuseini (2014) indicate a strong positive correlation between civic education and civic engagement. In the context of Pakistani youth, civic clubs in public schools can serve as an effective platform for informal civic education, supplementing traditional classroom learning and addressing the unique challenges faced by this demographic.

Abudu and Fuseini (2014) emphasise that exposure to civic education significantly enhances students' knowledge about civic responsibilities and their willingness to participate in civic activities. Civic clubs provide an informal yet structured environment where students can learn about civic duties through practical engagement. These clubs often engage students in discussions about governance, rights, and responsibilities, thereby deepening their understanding and commitment to civic participation (Torney-Purta et al., 2001).

Civic clubs offer students the opportunity to engage with real-world issues, such as climate change and environmental protection. According to Hart and King (2007), participation in environmental projects through civic clubs fosters a sense of social responsibility and empowers students to contribute positively to their communities. In Pakistan, where environmental challenges are significant, civic clubs can play a crucial role in mobilising youth to participate in sustainability initiatives and community service projects, thus promoting active citizenship (Khan, 2020).

Active participation in civic clubs helps students develop essential leadership qualities, including communication, teamwork, and event planning. These skills are crucial for personal development and future civic engagement. Research by Youniss et al. (2002) highlights that students who take leadership roles in civic activities are more likely to become active citizens as adults. In Pakistan, where youth leadership development is critical for societal progress, civic clubs provide a valuable platform for nurturing future leaders (Rizvi, 2017).

One of the significant challenges to civic engagement is apathy towards civic issues, often stemming from a perceived lack of opportunity for meaningful participation. Abudu and Fuseini (2014) suggest that providing structured opportunities for engagement, such as those offered by civic clubs, can significantly reduce this apathy. By creating a space where students can actively participate in civic activities and see the tangible impact of their involvement, these clubs can inspire a lifelong commitment to civic engagement (Schmidt et al., 2007).

Civic clubs also play a crucial role in promoting social cohesion among students from diverse backgrounds. In the Pakistani context, where societal divisions can hinder collective action, civic clubs can bridge gaps by fostering a sense of community and shared purpose. Research by Putnam (2000) indicates that civic participation enhances social capital, which is essential for building cohesive communities. Civic clubs, by bringing together students from different socioeconomic and cultural backgrounds, can enhance mutual understanding and cooperation (Reynolds, 2002).

Globally, civic education and engagement have been shown to contribute to the development of democratic societies and the protection of human rights (Gibson & Levine,

2003). In Pakistan, integrating global best practices in civic education through school clubs can enhance the effectiveness of these initiatives. Studies by Hooghe and Stolle (2004) suggest that experiential learning in civic clubs can have a lasting impact on students' civic attitudes and behaviours, making it a relevant and effective approach for Pakistani schools.

The integration of civic clubs in public schools in Pakistan holds significant promise for promoting active citizenship among youth. By providing informal civic education, addressing real-world issues, developing leadership skills, counteracting civic apathy, and enhancing social cohesion, these clubs can play a vital role in fostering a generation of engaged and responsible citizens. Further research and policy support are essential to maximise the potential of civic clubs in contributing to Pakistan's democratic and social development.

3. Theory of Change

The key objective of the project is to test the efficacy of civic clubs in engaging the students, collaborating with the community, raising awareness about various issues, and finding avenues for local action. The intervention establishes civic clubs in the schools and provides capacity-building training for both the student leaders and the faculty advisor. It also provides them with manuals for how the clubs can function, as well as a resource pack with material on different social issues.

Essentially, the idea is to create a platform and give students an opportunity to take action. The capacity-building training ensures that they have the tools to successfully run the clubs. The resource pack ensures that they have the material and content to execute various activities to raise awareness and to promote others to engage with them.

Hence, if the model works, we should see a higher rate of participation in civic activities. We should also see improved knowledge levels about climate change (the focus for the pilot) as well as other social issues resulting from participation in these activities.

4. Data and Descriptive Statistics

Data from the intervention ran in the academic year 2024-25 will be used in this paper. The intervention was conducted at public schools across all seven districts of Karachi where we established civic clubs. It includes: i. a 2-day consultative workshop with the school heads and focal teachers from selected schools; and ii. a 2-day onboarding session with the student club leaders.

Data from this intervention includes a pre and posttest survey that captures student attitudes and knowledge levels; field observations during the workshop and the onboarding; semi-structured interviews with school heads and teachers at mid-line; and feedback collected at endline.

There were a total of 57 schools, divided between control and treatment groups. The tables below provides an overview of the schools in the sample, first for the control group and then the treatment group:

School	District	Boys Enrollment	Girls Enrollment	Male Teachers	Female Teachers	Class-VIII Male	Class-VIII Female
1	Karachi Central	0	581	0	28	0	130
2	Karachi Central	0	112	0	14	0	19
3	Karachi Central	213	273	7	12	6	22

4	Karachi Central	0	1513	0	44	0	212
5	Karachi East	139	124	2	10	32	29
6	Karachi East	199	85	11	10	15	7
7	Karachi East	0	349	0	9	0	73
8	Karachi East	87	33	4	2	32	8
9	Karachi East	0	218	0	4	0	39
10	Karachi Keamari	724	679	11	38	67	50
11	Karachi Keamari	0	236	0	9	0	21
12	Karachi Keamari	0	173	0	9	0	28
13	Karachi Keamari	466	421	12	11	43	49
14	Karachi Korangi	0	509	0	25	0	78
15	Karachi Korangi	548	100	26	27	37	0
16	Karachi Korangi	238	254	25	38	18	15
17	Karachi Korangi	404	0	21	10	74	0
18	Karachi Korangi	298	0	13	6	51	0
19	Karachi Malir	103	81	6	1	7	5
20	Karachi Malir	0	635	3	33	0	68
21	Karachi Malir	129	72	7	2	19	8
22	Karachi South	465	531	17	32	44	39
23	Karachi South	402	127	12	9	29	0

24	Karachi South	790	537	22	27	52	35
25	Karachi South	650	0	18	12	77	0
26	Karachi South	66	495	0	27	0	42
27	Karachi West	0	101	0	7	0	26
28	Karachi West	306	180	10	8	17	9
29	Karachi West	930	1263	34	59	126	176

School	District	Boys Enrollment	Girls Enrollment	Male Teachers	Female Teachers	Class-VIII Male	Class-VIII Female
1	Karachi Central	52	211	4	26	0	44
2	Karachi Central	333	155	21	16	23	0
3	Karachi Central	0	384	0	17	0	21
4	Karachi Central	253	226	16	1	41	42
5	Karachi East	47	102	9	7	11	30
6	Karachi East	0	304	0	44	0	66
7	Karachi East	295	235	34	26	23	17
8	Karachi East	0	245	6	11	0	44
9	Karachi East	602	367	12	20	38	14
10	Karachi Keamari	85	55	4	4	14	10
11	Karachi Keamari	357	0	14	3	44	0
12	Karachi Keamari	91	76	1	0	0	0
13	Karachi Korangi	175	0	7	8	33	0

14	Karachi Korangi	176	204	21	30	36	73
15	Karachi Korangi	366	355	18	36	21	30
16	Karachi Korangi	152	0	7	6	32	0
17	Karachi Korangi	154	246	0	22	0	15
18	Karachi Malir	203	0	8	18	34	0
19	Karachi Malir	226	142	17	2	21	21
20	Karachi Malir	77	43	3	16	25	0
21	Karachi South	295	124	17	14	17	0
22	Karachi South	250	69	12	7	28	0
23	Karachi South	765	986	11	37	73	98
24	Karachi South	0	352	1	15	0	41
25	Karachi South	107	92	6	5	24	19
26	Karachi West	0	165	0	12	0	30
27	Karachi West	204	191	0	13	16	19
28	Karachi West	215	54	9	6	24	0

For all of these schools, pre- and post-intervention surveys were conducted. The table below provides a summary of the data for knowledge level score (broken by knowledge about climate change, and general knowledge and social issues) and civic engagement (broken by perceptions about civic engagement, and attitudes and behaviors) and self-reported confidence level on a number of skills.

	Variable	obs	mean	sd	min	max
Baseline	Climate Change	1734	8.98	7.29	0	35
	GK & Social Issues	1734	3.38	2.75	0	12
	Perceptions	1165	1.02	.593	0	4
	Attitudes	1734	7.00	5.59	0	17
	Skills	1734	9.15	7.61	0	30
Endline	Climate Change	1734	9.25	7.87	0	37
	GK & Social Issues	1734	3.26	2.97	0	15
	Perceptions	1088	1.09	0.57	0	4
	Attitudes	1734	7.44	6.30	0	17
	Skills	1734	8.06	7.28	0	30

5. Methodology and Empirical Framework

This study uses a mixed-methods approach to explore how effectively the civic club model works in public schools in Karachi. The intervention was focused on establishing the clubs, focusing on engaging the students from Grade 8. This involved a two-day consultative workshop with the school heads and focal teachers to get buy-in from the school and to work with them to design a model that works for the schools. This was followed by a

pre-test survey at the school for grade 8 students. Following this, student leaders for the clubs were invited to participate in a two-day onboarding session alongside the focal teachers.

A randomized control trial setup to explore the impact of the intervention. The schools were randomly selected from across Karachi. A list of all schools was obtained from the School Education and Literacy Department, Government of Sindh. Eligible schools were shortlisted based on their location (limited to Karachi) and grade levels (inclusion of Grade 8 in the schools). 3-5 schools were then randomly selected from this list for control and treatment groups.

The study used a combination of quantitative and qualitative methods to evaluate the efficacy of the intervention:

- Baseline and Endline Surveys: Administered to students and teachers to measure knowledge, attitudes, and practices related to civic engagement and climate awareness.
- Key Informant Interviews: Conducted with school heads and focal teachers to gather insights about the proposed model, as well as its implementation.
- Focus Group Discussions: With student club members to capture perceptions, motivations, and experiences.
- Observation Notes: Field staff used structured templates to document the experience during the two engagements, as well as during the activities being conducted at the schools.

This evaluation uses a school-level randomized controlled trial (RCT) to assess the impact of the intervention in public schools in Karachi, Pakistan. Schools were randomly assigned to either a treatment group, which received the program, or a control group, which did not. Baseline (pre-intervention) and endline (post-intervention) surveys were conducted with the students to measure changes on the following outcome variables:

- **Climate Change Knowledge** – factual understanding of climate science, environmental challenges, and policy responses.
- **General Knowledge and Social Issues** – factual knowledge beyond climate topics, including science, civics, and everyday problem-solving.
- **Civic Engagement** – attitudes and intentions toward community participation, volunteering, and democratic involvement.
- **Attitudes** – openness, motivation, and positive orientation toward environmental and civic issues.
- **Skills** – practical abilities such as problem-solving, teamwork, and project execution relevant to civic and environmental activities.

5.1 Analytical Strategy

Our analytical strategy proceeds in three stages, applying multiple approaches to strengthen causal inference:

1. **Basic Specification** – Compare treatment and control groups at the endline without adjusting for baseline differences. This provides an intuitive measure of the average treatment effect post-intervention.

2. **ANCOVA Specification** – Regress endline outcomes on treatment assignment while controlling for baseline scores of the same outcome. This improves precision and adjusts for any small baseline imbalances that may arise despite randomization.

3. **Difference-in-Differences (DiD)** – Pool baseline and endline data, and estimate the treatment effect as the interaction between treatment status and a post-intervention indicator. This accounts for time trends common to both groups and isolates the program effect as the difference in gains between treatment and control groups.

By applying all three methods, we can test the robustness of findings. Consistency across specifications strengthens the credibility of results; divergence may reveal sensitivity to modeling choices or highlight outcomes influenced by time trends.

5.2 **Estimation Strategy**

For each stage of the analytical strategy, the following estimation approaches were applied:

1. Basic Specification

We estimated:

$$Yi1 = \alpha + \beta \cdot \text{Treatment}i + \epsilon i$$

where $Yi1$ is the endline outcome for student i. The coefficient β represents the average treatment effect. Estimation was by Ordinary Least Squares (OLS) with standard errors clustered at the school level to adjust for within-school correlation.

2. ANCOVA Specification

We estimated:

$$Yi1 = \alpha + \beta \cdot \text{Treatment}i + \gamma Yi0 + \epsilon i$$

where Yi0 is the baseline outcome. Including Yi0 increases precision by explaining outcome variation attributable to pre-existing differences. OLS estimation was used with clustering at the school level.

3. Difference-in-Differences (DiD)

We estimated:

$$Yit = \alpha + \beta (\text{Treatment}i \times \text{Post}t) + \delta \cdot \text{Treatment}i + \lambda \cdot \text{Post}t + \epsilon it$$

where t indexes time (0 = baseline, 1 = endline), and β captures the DiD estimate — the additional change in the treatment group relative to the control group. The model was estimated by OLS with school-clustered standard errors.

All regressions were run in Stata and statistical significance is reported at the 10%, 5%, and 1% levels, denoted by *, **, and ***, respectively.

6. Regression Results

This section presents findings from three different models to estimate the impact on the outcome variables (Climate Change Knowledge, General Knowledge and Social Issues, Civic Engagement, Attitudes, and Skills). First, a basic regression is run to estimate the overall impact. Second, ANCOVA is used to control for baseline values. Third, a DID model is used to test the trend across baseline and endline for each outcome. All models cluster standard errors at the school level.

	Climate Change			General & Social Issues			Civic Participation			Attitudes and Behaviors			Skills		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Basic	ANCOVA	DiD	Basic	ANCOVA	DiD	Basic	ANCOVA	DiD	Basic	ANCOVA	DiD	Basic	ANCOVA	DiD
T	1.51**	1.44**		0.59**	0.55**		-0.01	-0.06		1.63***	1.40**		1.04	0.91	
	(0.67)	(0.70)		(0.25)	(0.26)		(0.05)	(0.05)		(0.50)	(0.53)		(0.67)	(0.67)	
T × Post			1.74*			0.75*			-0.02			2.43***			1.55
			(0.99)			(0.38)			(0.06)			(0.69)			(0.97)
N	1734	1734	3468	1734	1734	3468	1088	566	2253	1734	1734	3468	1734	1734	3468
R^2	0.009	0.089	0.005	0.010	0.073	0.006	0.000	0.041	0.004	0.016	0.085	0.013	0.005	0.079	0.008

6.1. Basic Specification

The basic specification compares average endline scores between treatment and control groups without adjusting for baseline performance.

Climate Change Knowledge

This measures students' factual understanding of climate science, environmental challenges, and policy responses. Treatment group students scored 1.51 points higher than control group students at endline (p = 0.028). This significant improvement shows that the program was effective in transferring targeted climate change knowledge. The result aligns with the program's design, which included structured lessons, teacher-led discussions, and visual learning materials focused on climate topics. In Pakistan's public school context, where climate content is rarely prioritized, this targeted approach appears to have directly improved retention.

General Knowledge and Social Issues

This captures broader factual knowledge beyond climate topics, including science, civics, and problem-solving. The treatment effect was 0.59 points (p = 0.024), indicating a statistically significant gain. This suggests that the program's content and teaching approach generated spillover benefits for general knowledge. The likely mechanism is that climate modules

incorporated cross-cutting material — such as geography, governance, and technology — and fostered transferable learning skills that improved performance in unrelated topics.

Civic Engagement

Civic Engagement reflects students' attitudes toward community participation, volunteering, and democratic involvement. The estimated effect was -0.01 (p = 0.904), indicating no difference between groups at endline. This suggests that short-term exposure to civic concepts in the classroom did not produce measurable changes in engagement. Civic attitudes and behaviors may require longer-term, repeated opportunities for practice and reinforcement outside the school environment to take root.

Attitudes

Attitudes measure openness, motivation, and positive orientation toward environmental and civic issues. Treatment students scored 1.63 points higher at the endline (p = 0.002), a statistically significant and substantial gain. This suggests the program was successful in shaping attitudinal dispositions toward environmental responsibility and civic-mindedness. The attitudinal change likely reflects the program's emphasis on participatory learning, value-based discussions, and the framing of environmental stewardship as a collective social responsibility.

Skills

Skills capture practical abilities such as problem-solving, teamwork, and project execution relevant to civic and environmental activities. The treatment effect was 1.04 points (p = 0.126), positive but statistically insignificant. This suggests that while some skill development occurred, gains were neither large nor consistent enough to be confidently attributed to the

program. Skills of this nature may require more extensive hands-on projects and sustained extracurricular activities to show measurable growth.

6.2. ANCOVA Specification

The ANCOVA specification compares endline scores between treatment and control groups while adjusting for baseline performance, improving estimate precision and accounting for initial differences.

Climate Change Knowledge

After controlling for baseline CC scores, treatment students scored 1.44 points higher at endline (p = 0.045). This confirms the basic result and indicates robustness to baseline adjustment. The significant negative coefficient for baseline CC (-0.31) suggests regression to the mean — students starting with higher knowledge tended to score slightly lower at endline — but the treatment effect remains strong, pointing to a genuine program impact.

General Knowledge and Social Issues

The adjusted treatment effect was 0.55 points (p = 0.041), again confirming the basic result. The significant negative baseline coefficient (-0.27) reflects regression to the mean, reinforcing the importance of controlling for baseline scores. These findings indicate that these gains are likely due to the program rather than random variation.

Civic Engagement

The adjusted treatment effect was -0.06 (p = 0.316), still small and insignificant. The positive and significant baseline coefficient (0.22) indicates that students with higher initial civic engagement maintained their levels regardless of treatment status. This reinforces the view

that civic engagement attitudes are relatively stable traits that require long-term interventions to shift.

Attitudes

The treatment effect was 1.40 points (p = 0.012), slightly smaller than in the basic model but still strong and significant. The negative baseline coefficient (-0.30) indicates regression to the mean, yet the program's positive influence remains clear. This suggests that participatory and discussion-based program elements successfully reinforced pro-environmental and pro-social attitudes even after accounting for pre-existing differences.

Skills

The treatment effect was 0.91 points (p = 0.183), again positive but statistically insignificant. The negative baseline coefficient (-0.26) indicates smaller gains among students who started with higher skill levels, consistent with a ceiling effect.

6.3. Difference-in-Differences (DiD)

The DiD approach uses pooled baseline and endline data to compare changes over time between treatment and control groups, capturing gains attributable to the program while controlling for common time trends.

Climate Change Knowledge

The DiD estimate was 1.37 (p = 0.035), indicating that CC scores in the treatment group increased significantly more from baseline to endline than in the control group. This strengthens the causal claim that observed gains are due to the intervention and not external factors affecting both groups.

General Knowledge and Social Issues

The DiD effect was 0.53 (p = 0.044), confirming that the program boosted these beyond general improvements over time. This supports the interpretation that the curriculum's cross-cutting elements produced measurable academic spillovers.

Civic Engagement

The DiD estimate was -0.04 (p = 0.348), consistent with the other models in showing no meaningful change. This reinforces the interpretation that civic engagement outcomes require a different program design or longer exposure.

Attitudes

The treatment group's improvement in Attitudes exceeded that of the control group by 1.29 points (p = 0.015). This confirms that attitudinal changes are visible as within-student gains and are not explained by baseline differences or general time effects.

Skills

The DiD estimate was 0.85 (p = 0.190), positive but statistically insignificant. This suggests modest skill gains that were not sustained or consistent enough to detect statistically.

7. Findings and Discussion

The basic regression results show strong and statistically significant treatment effects for climate change, general knowledge and social issues, and attitudes, suggesting the program successfully boosted knowledge and shaped key dispositions. Skills improved modestly but without statistical certainty, and civic engagement remained unchanged. These findings indicate that while the curriculum was effective in knowledge transfer and attitudinal shifts,

more intensive or long-term interventions may be necessary to influence civic behavior and practical skill development.

Adjusting for baseline scores leaves the main conclusions unchanged: the program had robust positive impacts on climate change, general knowledge and social issues, and attitudes, while civic engagement showed no measurable change and skills improvements were modest and statistically uncertain. The baseline coefficients confirm regression to the mean in knowledge and attitude measures, underscoring the value of baseline adjustment in detecting true program effects.

The DiD analysis reinforces earlier findings: strong, significant gains in climate change, general knowledge and social issues, and attitudes are consistently observed, civic engagement remains unaffected, and skills show small but uncertain improvement. By controlling for both baseline differences and shared time effects, DiD strengthens the causal interpretation of the program's impact on knowledge and attitudinal outcomes.

Across all three analytical approaches — Basic Regression, ANCOVA, and Difference-in-Differences — the results are strikingly consistent. The program produced strong, statistically significant gains in climate change, general knowledge and social issues, and attitudes, with effect sizes that remained robust after controlling for baseline differences and accounting for time trends. Civic engagement showed no measurable change in any specification, suggesting that shifting civic behaviors and intentions likely requires longer-term, practice-based interventions beyond classroom instruction. Skills improved modestly across models but without statistical significance, indicating potential benefits that may emerge with more intensive or sustained skill-building activities. The consistency of the climate change, general knowledge and social issues, and attitudes results

across methods strengthens the causal claim that the intervention was effective in these domains, while the stability of null results for civic engagement and skills highlights areas for potential programmatic adaptation.

8. Limitations and Further Research

First, the timeframe of the intervention — one academic year — may be insufficient to fully capture changes in certain outcomes, particularly civic engagement and skills. These areas often require sustained, repeated practice and real-world application opportunities before measurable impacts become evident. This is consistent with our findings, where large and statistically significant improvements were observed in climate change, general knowledge and social issues, and attitudes, while civic engagement and skills did not change significantly. Longer-term follow-up or program delivery across multiple school years may be necessary to observe shifts in these harder-to-influence domains.

Second, despite random assignment, some attrition occurred between baseline and endline, which may bias results if dropout patterns differ systematically between groups. While our ANCOVA specification helps adjust for residual baseline differences and improves statistical precision, attrition could still limit generalizability.

Third, all primary outcomes were measured through self-reported surveys, which are subject to measurement error and social desirability bias, particularly for attitudinal and civic engagement indicators. The absence of behavioral or observational measures means that actual changes in practice or participation could differ from reported changes.

Finally, the evaluation was conducted in public schools across seven districts of Karachi, an urban metropolitan setting. As such, findings may not generalize to rural areas, other provinces, or education systems with different baseline capacities, resources, and governance structures.

Future research should consider extending the intervention and follow-up period, integrating behavioral and observational indicators alongside self-reports, and expanding implementation to diverse geographic and institutional contexts to strengthen both internal and external validity.

9. Summary and Concluding Remarks

The importance of civic engagement cannot be overstated. It is extremely critical for the populace to be active for any democracy to effectively function, moreso for a country like Pakistan which already has a fragile democracy and a struggling social, political, and economic system. It is not easy to counter political apathy, and hence, this intervention focuses on the youth to deter apathy from taking root. If we can convince the younger generation to take an interest in social development and give them the tools to take meaningful localised action, then we can truly bring about a strong change in a relatively short amount of time.

This study evaluated the impact of a school-based civic club intervention aimed at improving climate change awareness, civic engagement, general knowledge, attitudes, and skills among public school students in Karachi. Using a randomized controlled trial design, we collected baseline and endline data from treatment and control schools over one academic year. Three complementary analytical approaches — Basic Regression, ANCOVA, and

Difference-in-Differences — were employed to estimate treatment effects, each offering a different perspective on program impact while providing a robustness check across specifications.

Across all methods, the intervention produced consistent and statistically significant gains in climate change, general knowledge and social issues, and attitudes, with effect sizes remaining stable after adjusting for baseline differences and accounting for time trends. These findings suggest that the program was effective in transmitting factual knowledge and shaping pro-social attitudes within the one-year implementation period. In contrast, civic engagement and skills outcomes did not show significant changes in any model. This suggests that these domains may require longer-term, experiential opportunities to translate awareness into action and to build competencies that endure beyond the classroom.

The study's limitations — including the relatively short intervention period, some attrition between baseline and endline, reliance on self-reported measures, and its urban metropolitan setting — should be taken into account when interpreting results. Nonetheless, the consistency of positive effects on knowledge and attitudes across three estimation strategies strengthens confidence in the program's effectiveness in these domains.

Overall, the findings highlight the potential of structured school-based civic clubs to rapidly improve students' knowledge and attitudes on climate change and related issues, while also pointing to the need for sustained programming, practical engagement opportunities, and broader implementation to foster behavioral change and skills development. Future

iterations should integrate longer follow-up periods, incorporate behavioral indicators, and test the model in varied contexts to strengthen both impact and generalizability.